HITACHI

● SERVICE MANUAL

TK	No. 1570E

VK-C600(U,C),E

Technical Data

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

COLOR VIDEO CAMERA

Jun 1981 **TOKAI WORKS**

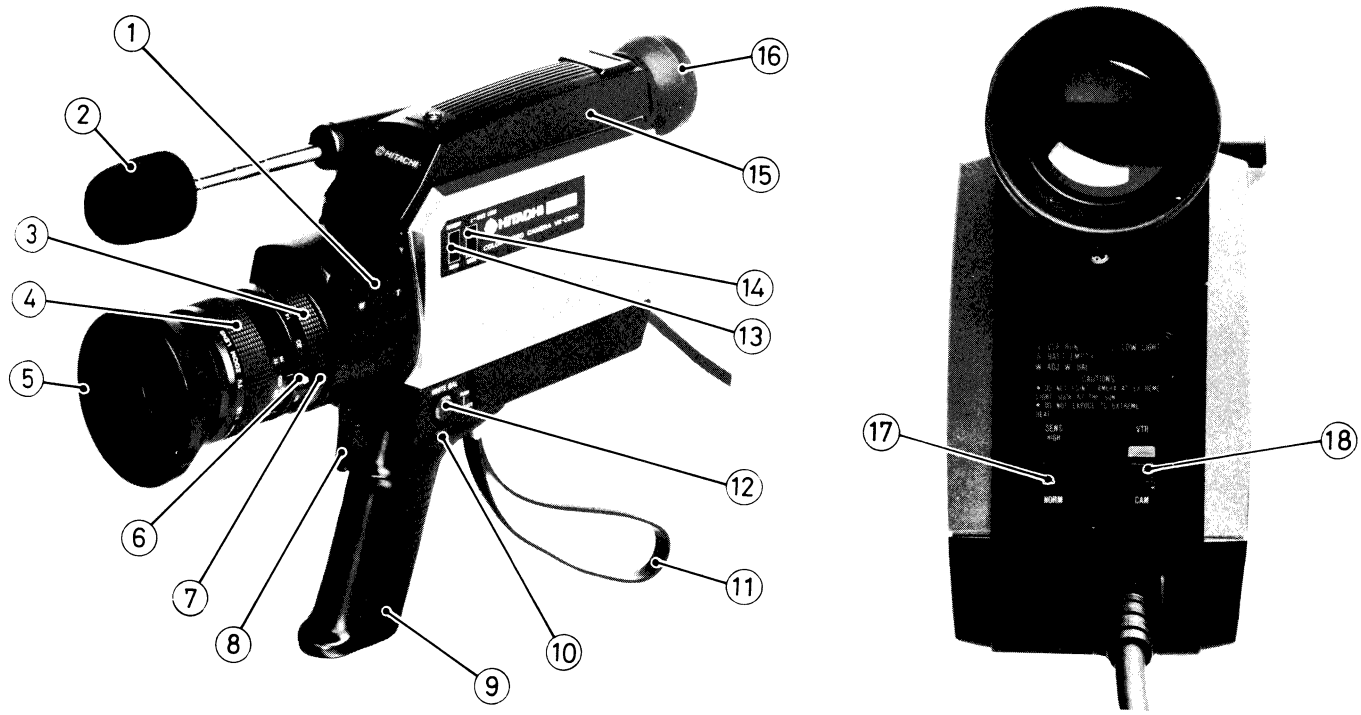
CONTENTS

SPECIFICATIONS 2
KEY TO ILLUSTRATIONS 3
DISASSEMBLY 4
TROUBLESHOOTING 6
1. Camera check flowchart 6
2. Viewfinder check flowchart 11
ADJUSTMENT 13
Before staring adjustment 13
Adjustment after exchanging VIDICON 15
1. Adjusting the beam voltage 15
2. Adjusting the field focus 15
3. Adjusting the tilt of the black mask and the back focus 15
4. Adjusting the scan size (picture size, center) 16
5. Adjusting dark current 17
6. Adjusting ASC 17
7. Adjusting offset 17
8. Adjusting matrix balance 18
9. Adjusting black balance 18
10. Adjusting set-up 18
11. Adjusting white balance 18
12. Adjusting crosstalk balance 18
13. Adjusting the level indicator 19
14. Adjusting auto-iris 19
15. Adjusting white balance indicator 19
16. Adjusting the AGC operation point 19
Adjustment after replacing CRT 20
1. Adjusting focus 20
2. Adjusting centering 20
3. Adjusting luminance/contrast 20
4. Adjusting vertical size 20
Adjustment after replacing lens 20
1. Adjusting tilt of black mask, back-focus 20
Adjusting circuit 21
1. Adjusting power voltage 21
2. Adjustment after replacing the VIDICON 21
3. Adjustment after replacing the CRT 21
4. Adjusting vertical/horizontal hold of the viewfinder 21
SCHEMATIC DIAGRAMS & CIRCUIT BOARD DIAGRAMS 22
Pre amp schematic diagram 22
Pre amp circuit board diagram 22
Video schematic diagram 24
Video circuit board diagram 27
Deflection circuit board diagram 29
Deflection schematic diagram 31
White balance P.C.B, trigger P.C.B, mic P.C.B, side switch P.C.B, indicator P.C.B, socket P.C.B, rear switch P.C.B. 34
Block diagram 35
Circuit board connection diagram 37
Video circuit waveforms 39
Deflection circuit waveforms 41
REPLACEMENT PARTS LIST 45
EXPLODED VIEW 47

SPECIFICATIONS

Type:	VK-C600
Color system:	VK-C600(U, C): Based on NTSC system
	VK-C600E: Based on PAL system
Camera tube:	Tri-Electrode 2/3- inch vidicon (HS 256 or equivalent)
Number of scanning lines:	525 lines 2:1 interlace (For U, C)
	625 lines 2:1 interlace (For E)
Synchronization system:	Internal synchronization
Video output:	1 Vp-p 75 Ω(Unbalanced)
Video S/N ratio:	More than 45 dB
Standard object luminance:	2,000 lux
Minimum luminance required:	75 lux (F1.6)
Built-in microphone:	Uni-directivity electret condenser microphone
External mic input:	–65 dB, high impedance
Audio line output:	–20 dB, low impedance
Lens (accessory):	F1.6, f = 14~ 84 mm zoom (x6)
Lens mount:	Special mount (with auto iris power zoom, macro mechanism)
Dia. of filter screw:	52 mm, thread pitch 0.75 mm
Viewfinder:	Electronic viewfinder system
	Cathode ray tube: 1.5" cathode ray tube
	Video input: 1 Vp-p, 75 Ω(Unbalanced)
	Display functions: Recording, quantity of light, battery, white balance
Color temperature control:	From tungsten bulb illumination to cloudy weather
Automatic sensitivity control range:	75 ~100,000 lux
Power voltage:	DC 12V
Power consumption:	6.7W
External dimensions:	81(W) x 242(H) x 330(D) mm (Grip included)
Weight:	1.9 kg (Electronic viewfinder, attached microphone included)
Accessories:	Grip x 1

KEY TO ILLUSTRATIONS

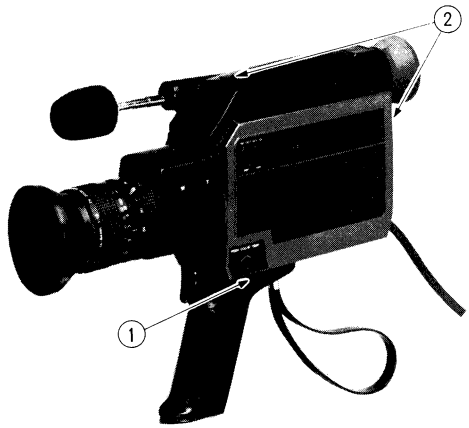


1. POWER ZOOM SWITCH
2. BOOM MICROPHONE
3. ZOOMING RING
4. FOCUS ADJUST RING
5. ZOOM LENS
6. MACRO SELECT BUTTON
7. ZOOMING LEVER
8. REMOTE CONTROL SWITCH
9. GRIP
10. NUT FOR SECURING HAND GRIP
11. BAND STRAP
12. WHITE BALANCE CONTROL KNOB
13. POWER SAVER SWITCH (FOR U, C)
    STAND-BY SWITCH (FOR E)
14. EXPOSURE CORRECT SWITCH
15. ELECTRONIC VIEWFINDER
16. EYE CUP
17. SENSITIVITY SWITCH
18. VTR/CAMERA SELECT SWITCH

DISASSEMBLY

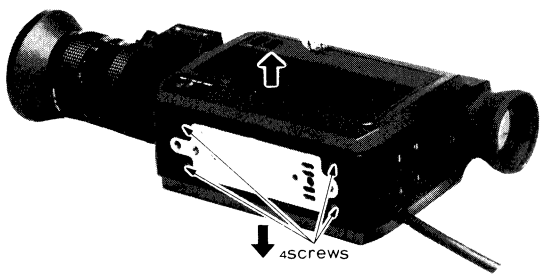
1. Grip/top cover

1) Remove the grip fixing screw by turning it.
2) Remove 2 screws.



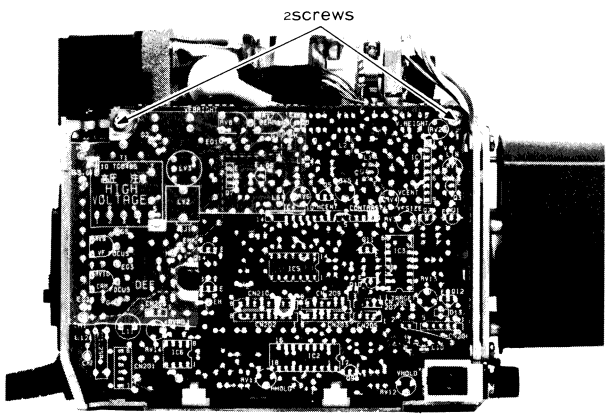
2. Side cover (R, L)

1) Remove the grip and top cover. (Refer to Item 1)
2) Remove 4 screws.
3) Remove the side cover in the direction of the arrow.



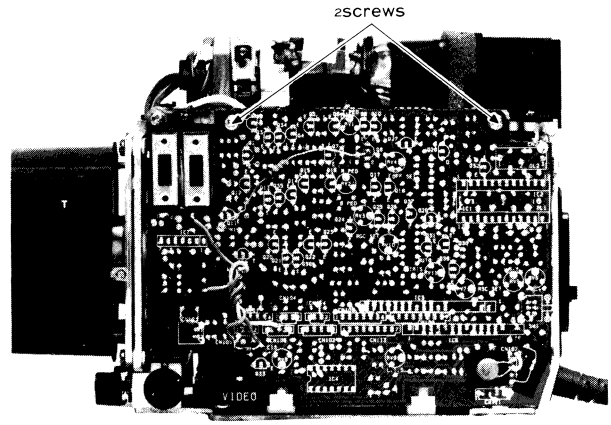
3. Video PC Board

2 screws



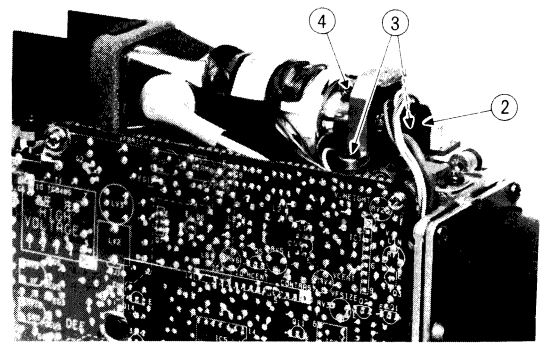
4. DEF PC Board

2 screws



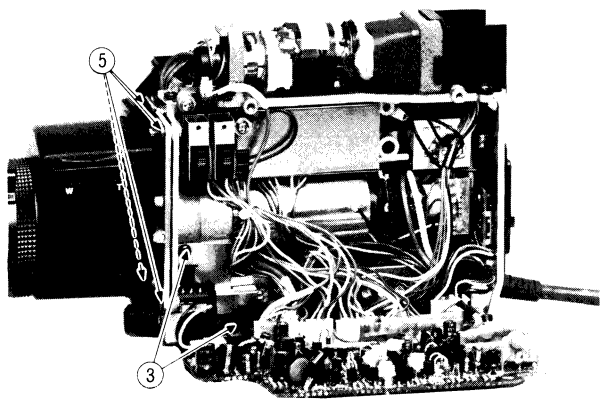
5. CRT (Cathode Ray Tube)

1) Remove the DEF PC Board fixing screw to open the PC Board. (Refer to Item 4)
2) Remove the anode cap and CRT socket.
3) Remove 2 CRT bracket fixing screws to remove the bracket and the CRT holding rubber fitting.
4) Loosen the deflection yoke tightening screw to pull out the deflection yoke.



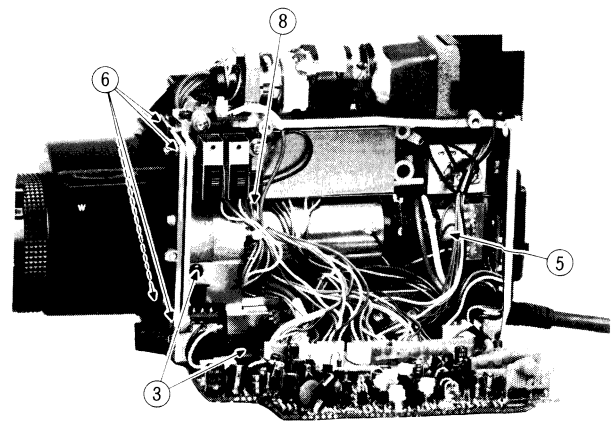
6. Lens

1) Remove the grip, top cover and side cover. (Refer to Item Nos. 1, 2)
2) Remove the video PC Board and DEF PC Board fixing screws and open the PC Board. (Refer to Item Nos. 3, 4)
3) Remove the lead cover fixing screw of the pre-amplifier.
4) Remove the connector from the lens. CN102 (Video PC Board), CN204 (DEF PC Board)
5) Remove 4 lens mount fixing screws.
6) Turn the lens to the left a little while holding the lens body, and remove the coil ass'y fixing screw from inside to remove the lens.
7) Mount the lens by the reverse procedure.



7. VIDICON

1) Remove the grip, top cover and side cover. (Refer to Item Nos. 1, 2)
2) Remove the video PC Board and DEF PC Board fixing screws to open the PC Board. (Refer to Item Nos. 3, 4)
3) Remove 2 lead cover fixing screws from the pre-amplifier.
4) Remove the target connector connected to the pre-amplifier.
5) Remove the VIDICON socket.
6) Remove 4 lens mount fixing screws.
7) Turn the lens to the left a little while holding the lens body and remove 3 coil ass'y fixing screws from inside, and separate the lens and the coil ass'y.
8) Loosen the VIDICON clamp screw and push the VIDICON forward.
9) Use the reverse procedure to mount the VIDICON.

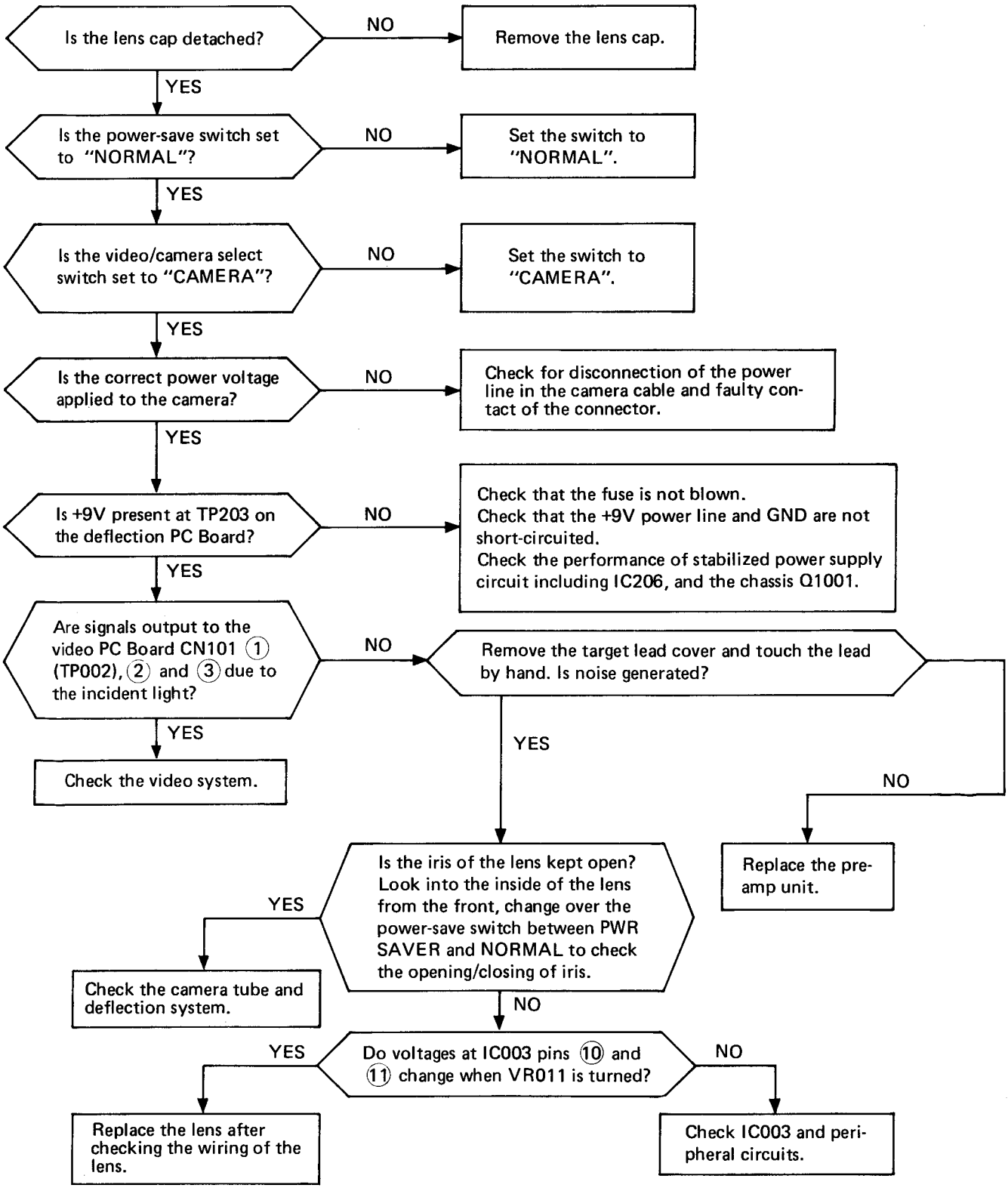


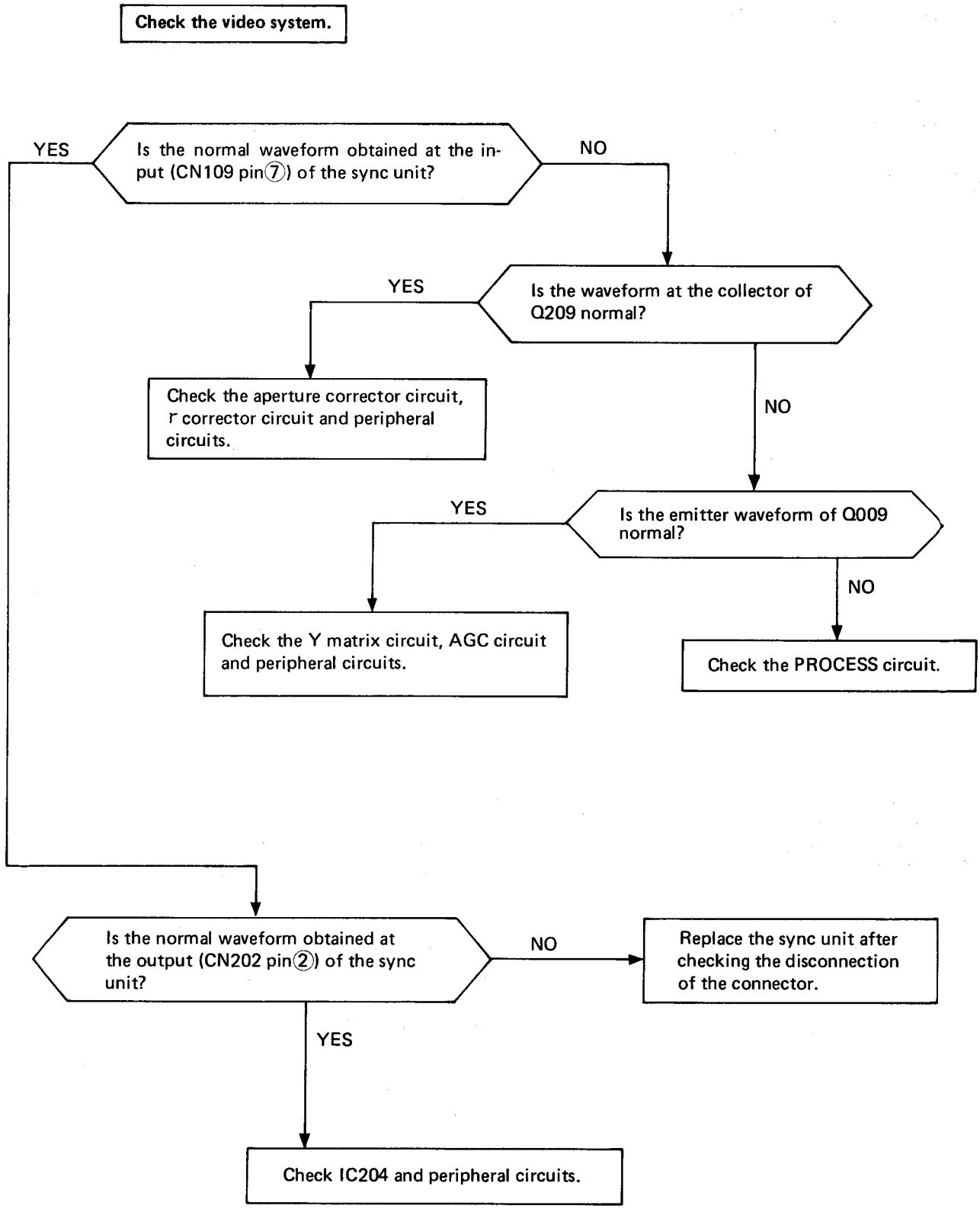
TROUBLESHOOTING

Check the following before checking the camera and viewfinder.
1) Connection of the camera and TV set, and positions of the operation switches.
2) Power voltage supplied to the camera.

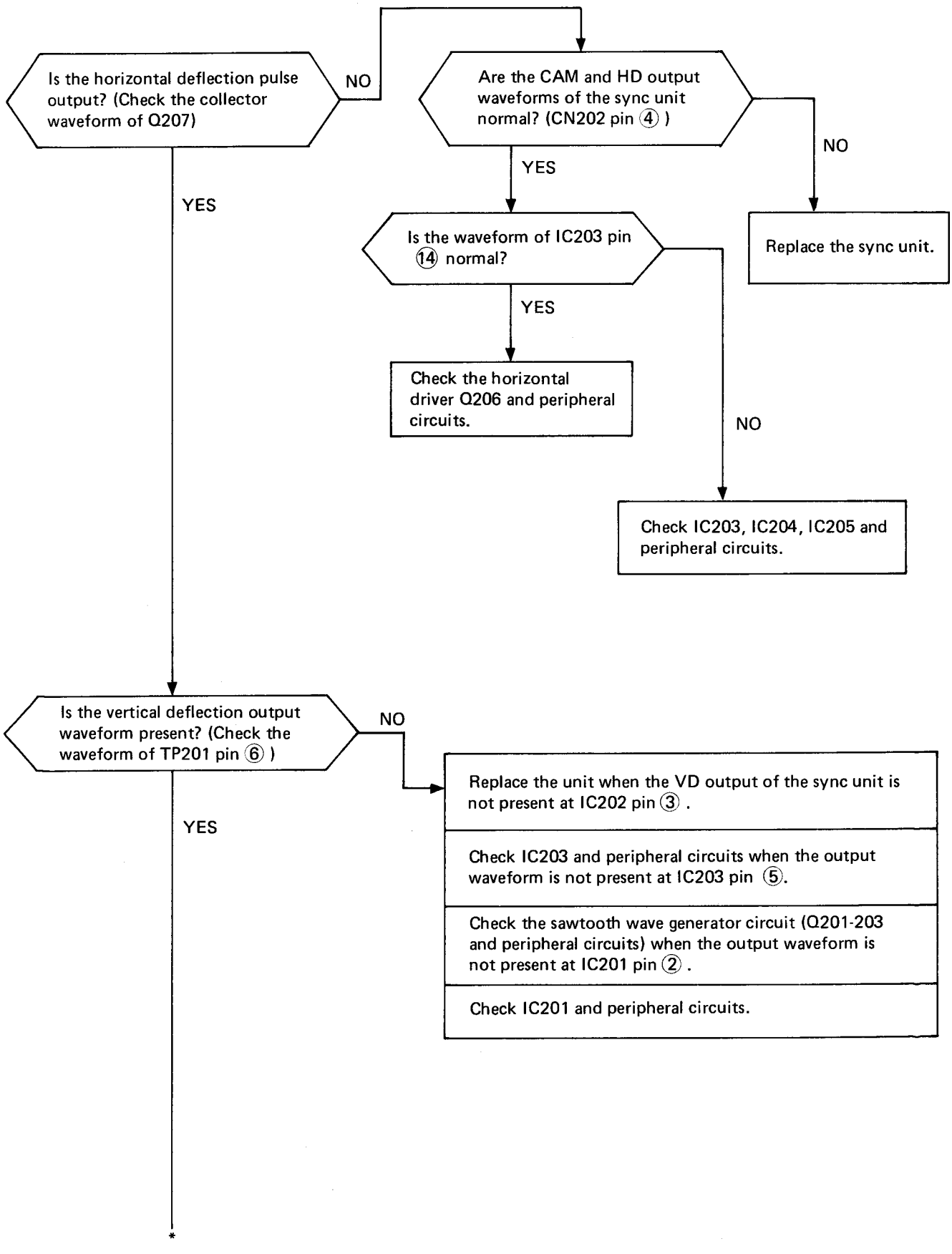
1. Camera check flowchart

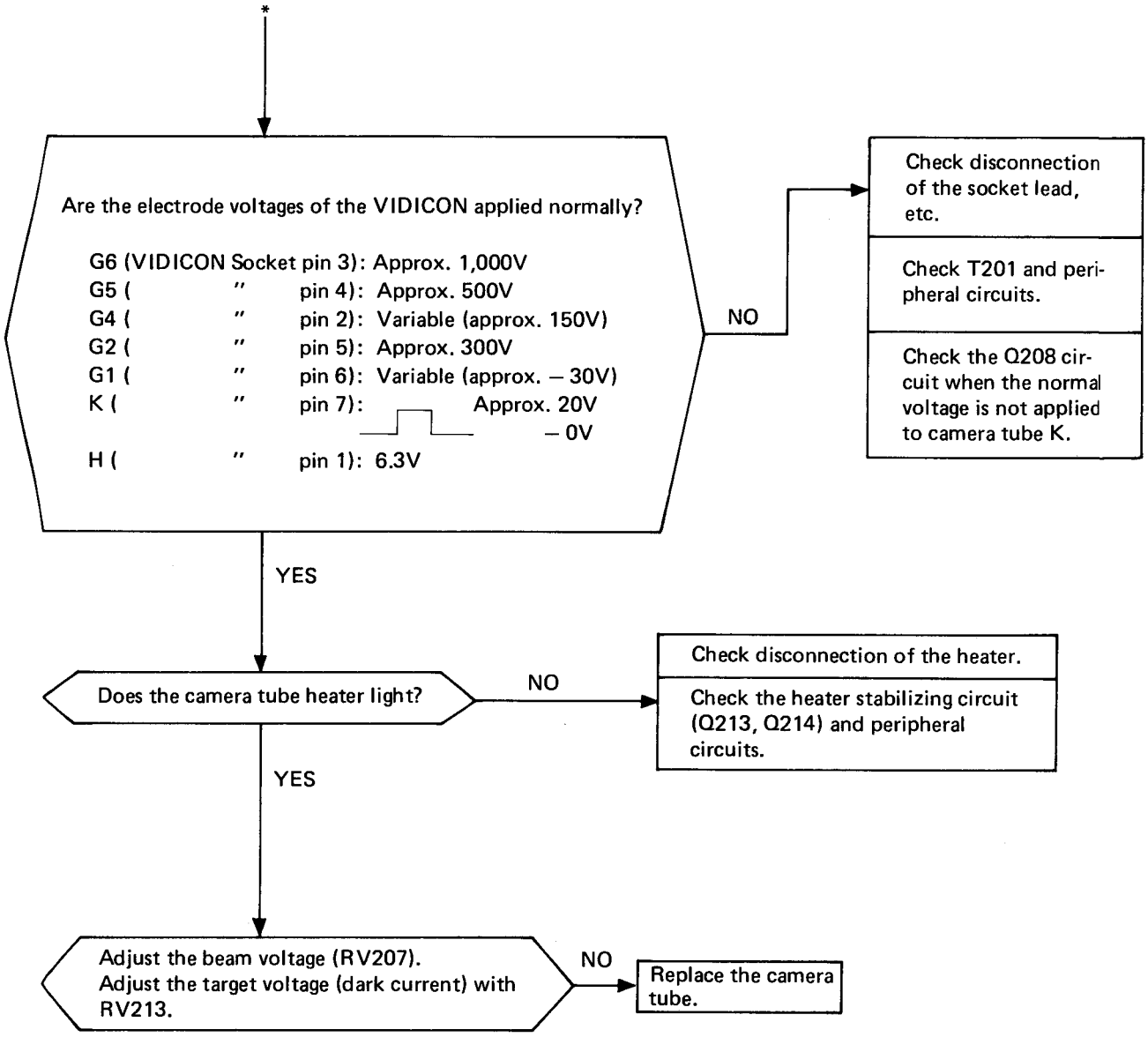
1) No picture


Is the lens cap detached?
NO
Remove the lens cap.
YES
Is the power-save switch set to "NORMAL"?
NO
Set the switch to "NORMAL".
YES
Is the video/camera select switch set to "CAMERA"?
NO
Set the switch to "CAMERA".
YES
Is the correct power voltage applied to the camera?
NO
Check for disconnection of the power line in the camera cable and faulty contact of the connector.
YES
Is +9V present at TP203 on the deflection PC Board?
NO
Check that the fuse is not blown.
Check that the +9V power line and GND are not short-circuited.
Check the performance of stabilized power supply circuit including IC206, and the chassis Q1001.
YES
Are signals output to the video PC Board CN101 ① (TP002), ② and ③ due to the incident light?
NO
Remove the target lead cover and touch the lead by hand. Is noise generated?
YES
Check the video system.
YES
NO
Is the iris of the lens kept open? Look into the inside of the lens from the front, change over the power-save switch between PWR SAVER and NORMAL to check the opening/closing of iris.
Replace the pre-amp unit.
YES
Check the camera tube and deflection system.
NO
YES
Do voltages at IC003 pins ⑩ and ⑪ change when VR011 is turned?
NO
Replace the lens after checking the wiring of the lens.
Check IC003 and peripheral circuits.

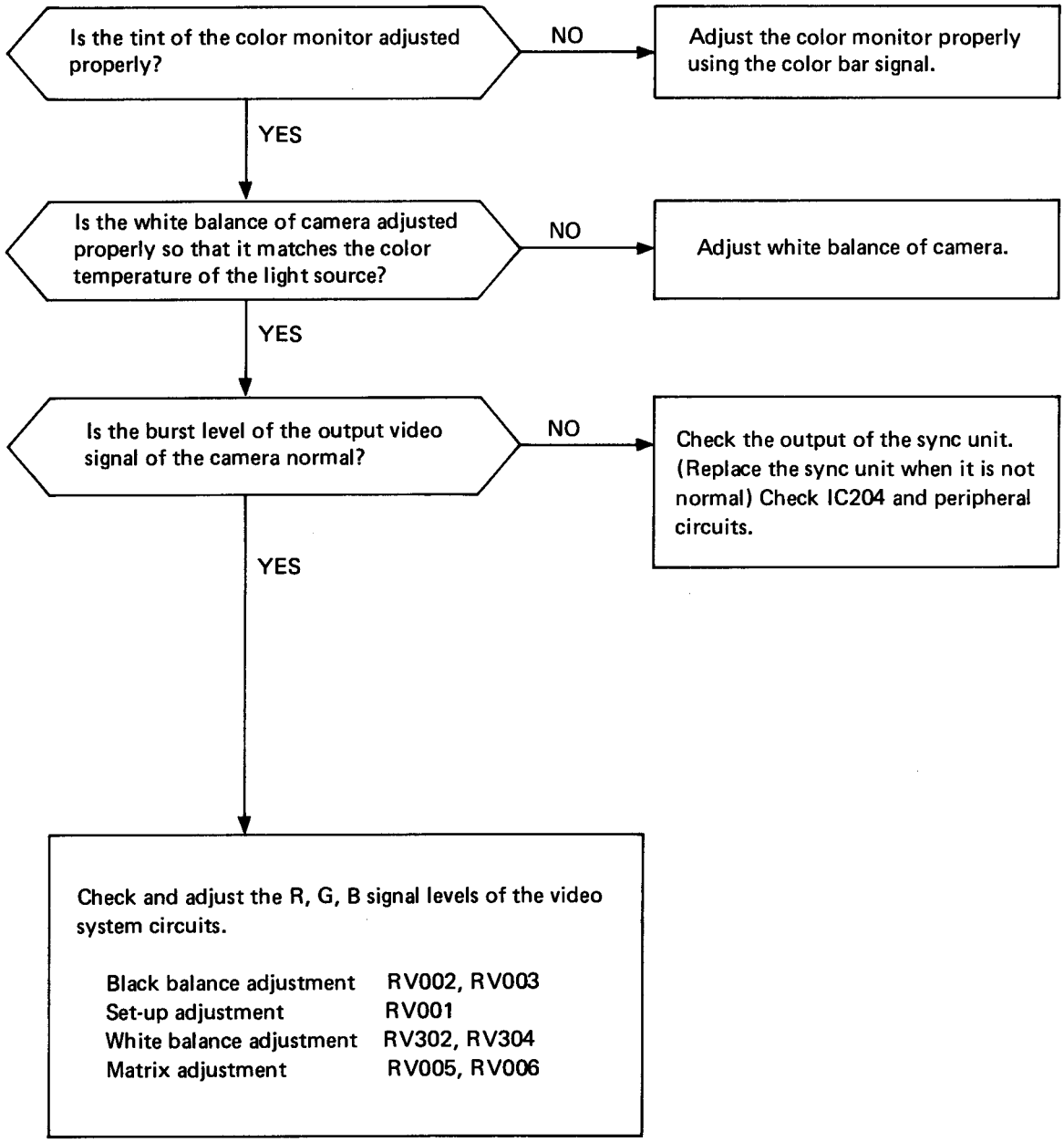

Check the video system.
Is the normal waveform obtained at the input (CN109 pin⑦) of the sync unit?
YES
NO
Is the waveform at the collector of Q209 normal?
YES
NO
Check the aperture corrector circuit, Γ corrector circuit and peripheral circuits.
Is the emitter waveform of Q009 normal?
YES
NO
Check the Y matrix circuit, AGC circuit and peripheral circuits.
Check the PROCESS circuit.
Is the normal waveform obtained at the output (CN202 pin②) of the sync unit?
NO
Replace the sync unit after checking the disconnection of the connector.
YES
Check IC204 and peripheral circuits.

Checking the camera tube and deflection system


Is the horizontal deflection pulse output? (Check the collector waveform of Q207)
NO
Are the CAM and HD output waveforms of the sync unit normal? (CN202 pin ④)
NO
YES
YES
Is the waveform of IC203 pin ⑭ normal?
Replace the sync unit.
YES
Check the horizontal driver Q206 and peripheral circuits.
NO
Check IC203, IC204, IC205 and peripheral circuits.
Is the vertical deflection output waveform present? (Check the waveform of TP201 pin ⑥)
NO
YES
Replace the unit when the VD output of the sync unit is not present at IC202 pin ③ .
Check IC203 and peripheral circuits when the output waveform is not present at IC203 pin ⑤.
Check the sawtooth wave generator circuit (Q201-203 and peripheral circuits) when the output waveform is not present at IC201 pin ② .
Check IC201 and peripheral circuits.
*

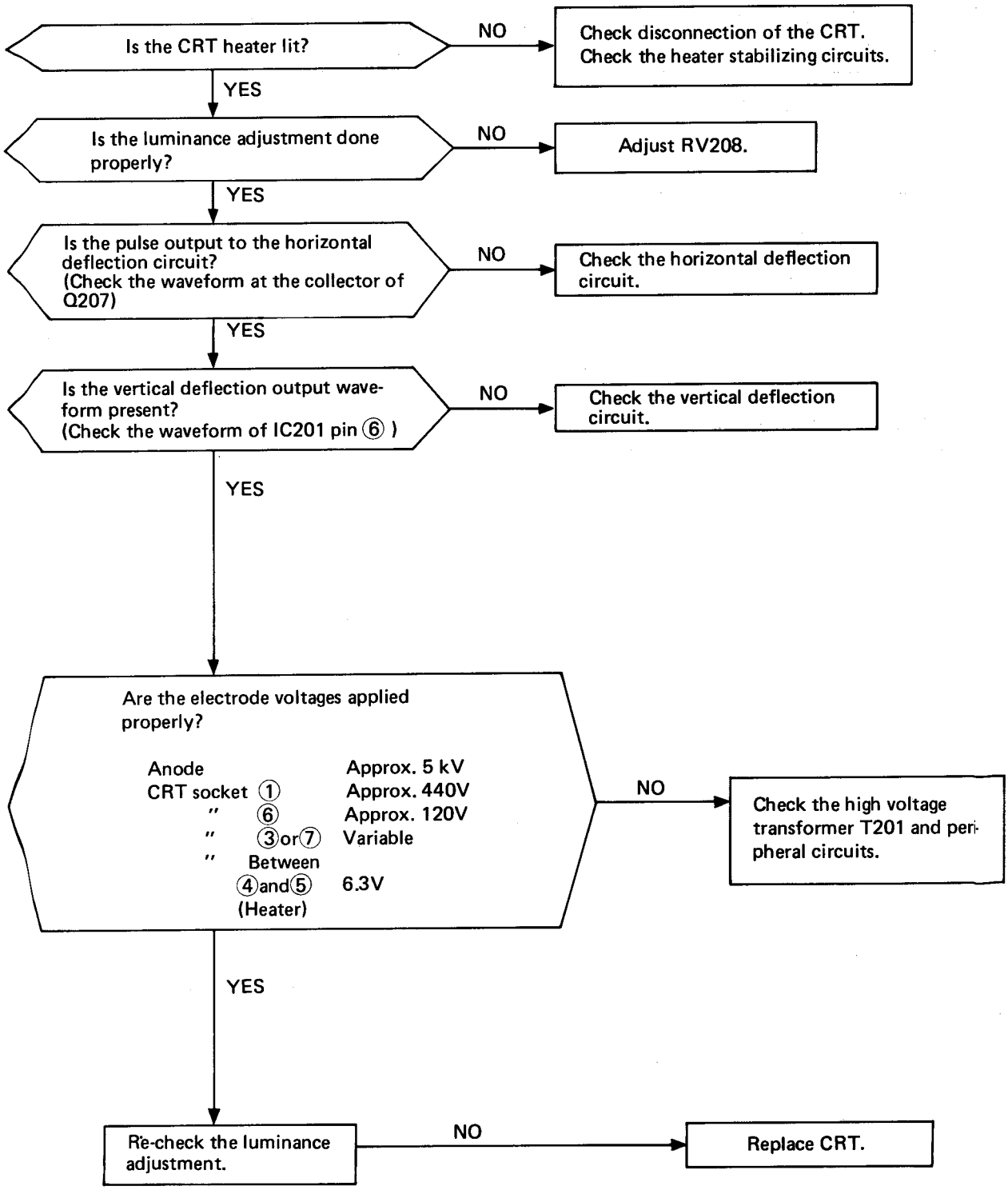

*
Are the electrode voltages of the VIDICON applied normally?
G6 (VIDICON Socket pin 3): Approx. 1,000V
G5 (" pin 4): Approx. 500V
G4 (" pin 2): Variable (approx. 150V)
G2 (" pin 5): Approx. 300V
G1 (" pin 6): Variable (approx. – 30V)
K (" pin 7): Approx. 20V
– 0V
H (" pin 1): 6.3V
NO
Check disconnection of the socket lead, etc.
Check T201 and peripheral circuits.
Check the Q208 circuit when the normal voltage is not applied to camera tube K.
YES
Does the camera tube heater light?
NO
Check disconnection of the heater.
Check the heater stabilizing circuit (Q213, Q214) and peripheral circuits.
YES
Adjust the beam voltage (RV207).
Adjust the target voltage (dark current) with RV213.
NO
Replace the camera tube.

2) Color in picture or the incorrect color in picture

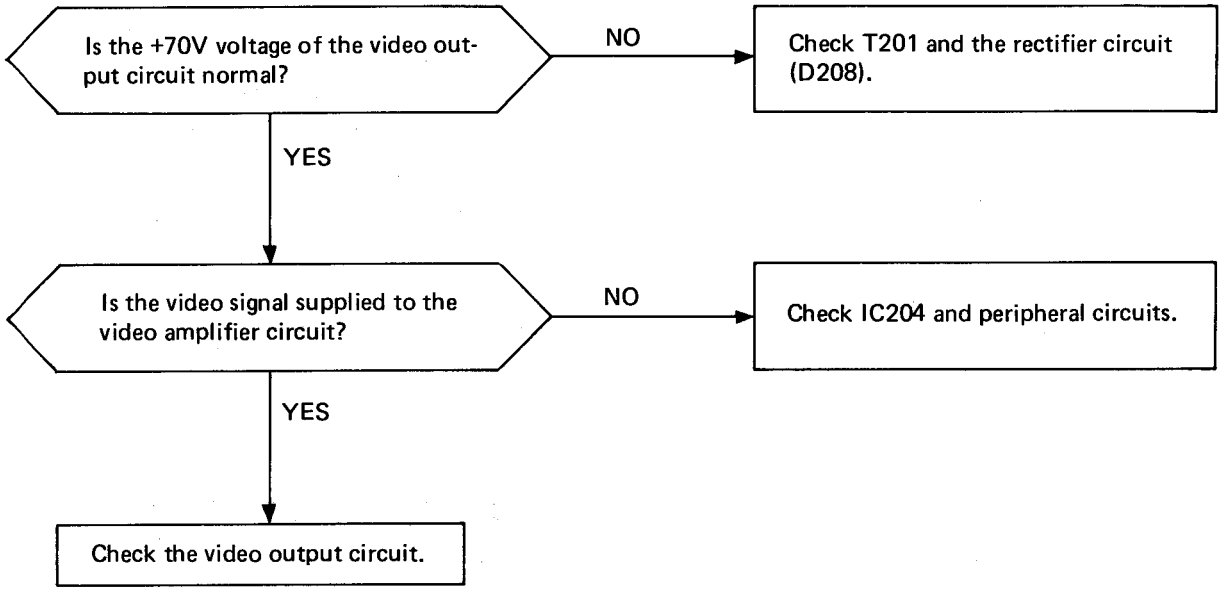

Is the tint of the color monitor adjusted properly?
NO
Adjust the color monitor properly using the color bar signal.
YES
Is the white balance of camera adjusted properly so that it matches the color temperature of the light source?
NO
Adjust white balance of camera.
YES
Is the burst level of the output video signal of the camera normal?
NO
Check the output of the sync unit. (Replace the sync unit when it is not normal) Check IC204 and peripheral circuits.
YES
Check and adjust the R, G, B signal levels of the video system circuits.
Black balance adjustment RV002, RV003
Set-up adjustment RV001
White balance adjustment RV302, RV304
Matrix adjustment RV005, RV006

2. Viewfinder check flowchart

1) Raster does not appear



2) No picture


Is the +70V voltage of the video output circuit normal?
NO
Check T201 and the rectifier circuit (D208).
YES
Is the video signal supplied to the video amplifier circuit?
NO
Check IC204 and peripheral circuits.
YES
Check the video output circuit.

ADJUSTMENT

BEFORE STARTING ADJUSTMENT

Check the following before starting adjustment.

1. Connection

Connections between the camera and power supply, TV set, etc.

2. Measurement instruments and tools

Measuring instruments:
Oscilloscope, DC voltmeter
Tools:
(+) screwdriver, (–) screwdriver (small), Adjustment screwdriver, Core driver, color viewer (31000K), test chart A, grey scale chart (11 steps, with black mask), color bar chart, scale, tripod, TV set.

3. Preparation

Distance between the camera and object

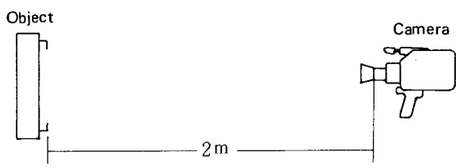


Fig. 1

Positions of switches, etc.

Sensitivity switch:	Normal
VTR/camera select switch:	Camera
Power-save switch:	"PWR SAVER" during preparation and "NORMAL" during adjustment.
Exposure correction:	Standard
White balance adjustment:	Position shown in Fig. 2.

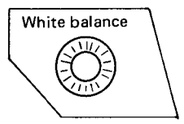
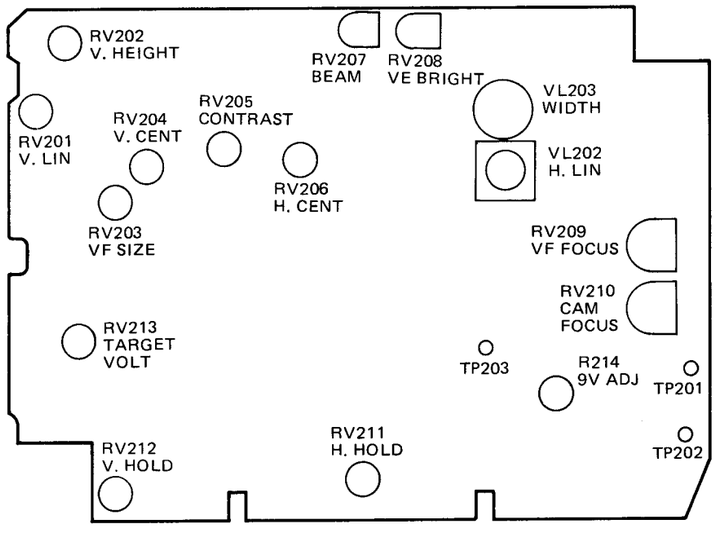
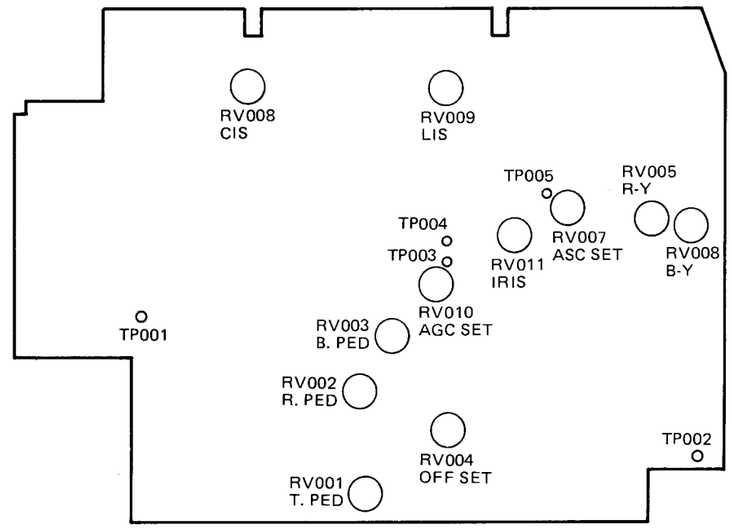


Fig. 2

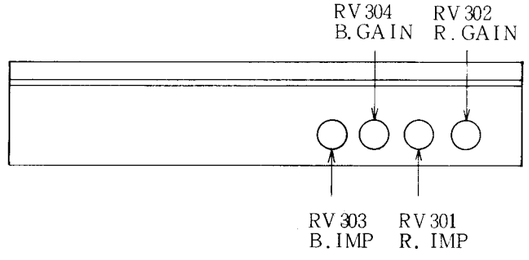
Time axis of oscilloscope
H (horizontal) period not generally specified. It is specified in the text when adjusting with the V (vertical) period.
External trigger of the oscilloscope
H period: From CN210 pin 1 or 2.
V period: From CN210 pin 3 or 4.
Bring to focus using the focus control ring when the chart is shot for adjustment.
Set to the position where the chart fills the TV screen when the zoom position is not specified.



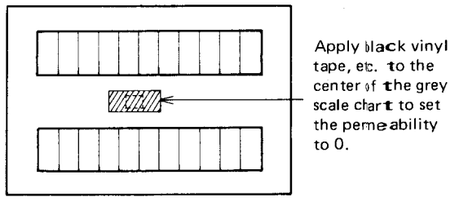
DEF PC Board (parts side)



Video PC Board (parts side)



Pre-amp unit



Chart

ADJUSTMENT AFTER EXCHANGING VIDICON

1. Adjusting the beam voltage

RV207 (BEAM): Deflection PC Board

1) Shoot approx. 2 cm of the color viewer.

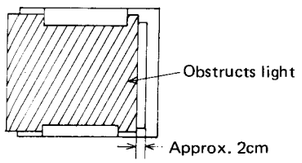


Fig. 3

2) Connect an oscilloscope to TP001 on the video PC Board.
3) Adjust zoom so that the waveform is clipped.
4) Adjust RV207 so that the waveform is 1.2Vp-p ± 0.1V.

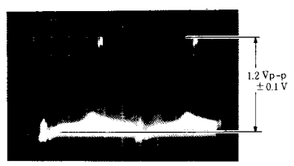


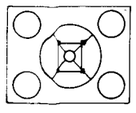
Fig. 4

2. Adjusting the field focus

Magnet ring: Deflection coil

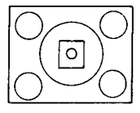
RV210 (CAM FOCUS): Deflection PC Board

1) Shoot the test chart A.
2) When the center of the picture moves as shown in Fig. 5 when RV210 is turned (alignment faulty), perform adjustment as shown below. When it does not move as shown in Fig. 6 (alignment adjustment completed), adjust RV210 so that the focus of the picture is best. (Note 1)



Alignment faulty (Center of the picture moves)

Fig. 5



Alignment adjustment completed (Center of the picture does not move)

Fig. 6

3) Peel off the lock-paint of the magnet rings at the back of the deflection coil.
4) Adjust 2 sheets of the magnet ring so that the center of the picture does not move when RV210 is turned. (Note 2)
5) Apply lock-paint to the magnet rings.
6) Adjust RV210 so that the focus of the picture is best.

Note 1. When the alignment adjustment is completed, the center of the picture does not move but it becomes in and out of focus when RV210 is turned.
2. The magnet rings can be adjusted easily in the following way.
(1) Turn RV210 fully clockwise viewed from the parts side.
(2) Adjust 2 sheets of the magnet ring so that the center of the picture comes to the center of the TV screen.
(3) Apply marking of the picture center on the TV screen.
(4) Turn RV210 fully counterclockwise viewed from the parts side.
(5) Adjust 2 sheets of the magnet ring so that the center of the picture coincides with the position marked previously.
(6) Repeat items (1) ~ (5) to adjust so that the center of the picture does not move when RV210 is turned.

3. Adjusting the tilt of the black mask and the back focus

Tilt of black mask

1) Shoot the color viewer without a chart inserted.
2) Loosen the VIDICON tightening screw. (Fig. 7)
3) Push the VIDICON forward until it stops.
4) Turn RV206 to make black mask appear on the screen. (Fig. 8)
5) Connect an oscilloscope to TP202 on the deflection PC Board.
6) Minimize deviation (width) of the leading edge of the waveform. (Fig. 9, 10)

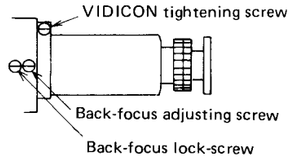


Fig. 7

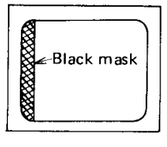


Fig. 8

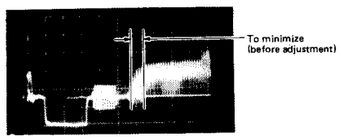


Fig. 9

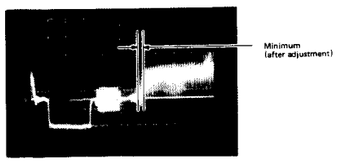


Fig. 10

Back-focus

1) Shoot a ordinary object (500 Lux or more) 3 m or more away.
2) Set zoom to most telephoto (T end).
3) Turn the focus ring to focus.
4) Set zoom to wide-angle (W end).
5) Loosen the back-focus lock screw. (Fig. 7)
6) Turn the back-focus adjusting screw to focus.
7) Set so that it is in focus with zoom at both telephoto and wide-angle.
8) Tighten the back-focus lock screw after adjustment is completed.

4. Adjusting the scan size (picture size, center)

RV206 (H. CENT), RV202 (HEIGHT), VL203 (WIDTH), RV201 (V. LIN), VL202 (H. LIN), RV204 (V. CENT) . . . . . Deflection PC Board

1) Shoot the test chart A.
2) Turn VL203 and RV202 to reduce the size of the picture so the edges appear. (Note 1)
3) Adjust zoom and camera angle so that the external frame of the chart keeps contact with the edges of the screen. (Note 2) Fig. 11

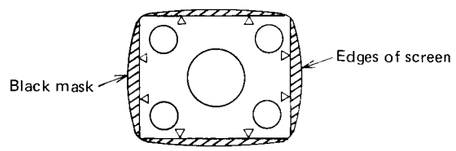


Fig. 11

4) Adjust VL202 and RV201 so that the circles are round. (Notes 3, 4)
5) Turn VL203 and RV202 to widen the picture. (Note 5)
6) Connect an oscilloscope to TP202 on the deflection PC Board.
7) Adjust RV206 so that the black mask is 0.3~ 0.7 μs. (Note 6) Fig. 12

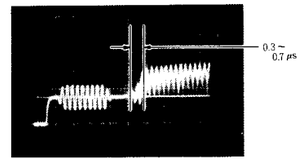


Fig. 12

8) Adjust VL203 to set the video signal of the chart to the video period. (Note 7) Fig. 13

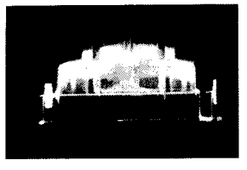


Fig. 13

9) Set the oscilloscope to the V period.
10) Adjust RV202, RV204 to set the video signal of the chart to the video period.

Note 1. When the edges of the screen are not seen with VL203 turned fully, turn VL202 while watching the TV screen. Do not turn VL202 too much. When it is turned too much, the video period cannot be discriminated.

2. Set so that mark "V" which indicates the chart edge keeps contact with the edges of the screen.
3. Set so that the circles in the picture are round. When they cannot be made round, set so that the left and the right, top and bottom circles are symmetrical and nearly round.
4. The best adjustment point of linearity and the minimum shading point are roughly in accord. Check it in the following way.

(1) Shoot the color viewer.
(2) Connect an oscilloscope to TP202 on the deflection PC Board.
(3) Observe the waveforms of the H period and V period using the oscilloscope.
(4) When shading is too much in the H period, fine-adjust VL202; when shading is too much in the V period, adjust RV201. Fig. 14

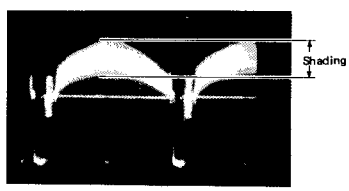


Fig. 14

5. Widen the chart to fill the screen watching theTV screen.
6. Mis-clamp occurs when black mask is too narrow. Imperfect raster may occur on the left end of the screen when it is too wide.
7. Set the right side of the picture of the chart to the video period as shown in Fig. 13, and the left side, 0.3 ~ 0.7 μs narrower than the video period. The sweep time is lengthened in Fig. 13 (period: H period), so it is seen to fill the video period.

5. Adjusting dark current

RV213 (TARGET VOLT): Deflection PC Board

1) Apply the lens cap.
2) Connect an oscilloscope to TP001 on the video PC Board. (Note 1)
3) Adjust RV213 so that section A of the waveform is 80mVp-p.

Note 1. When the waveform is hard to see due to noise, connect a 100 k Ω resistor in series to the probe (10:1) and check the waveform.

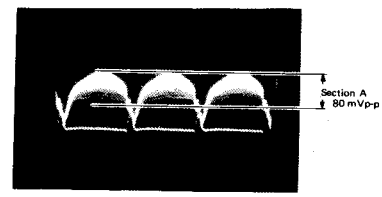


Fig. 15

6. Adjusting ASC

RV007 (ASC SET): Video PC Board

1) Apply the lens cap.
2) Turn RV010 fully clockwise (viewed from the parts side).
3) Set the oscilloscope to the DC range and connect it to TP005 on the video PC Board.
4) Adjust RV007 to set to 3V± 0.05V.

7. Adjusting offset

RV007 (OFFSET): Video PC Board

1) Apply the lens cap.
2) Set the oscilloscope to the DC range and connect it to TP004 on the video PC Board.
3) Adjust RV004 so that the potential at section A does not change (or is within ±0.05V) when the sensitivity switch is changed over between "HIGH" and "STANDARD".

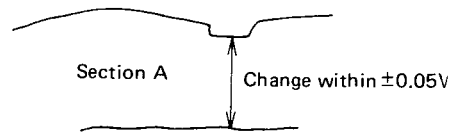


Fig. 16

8. Adjusting matrix balance

RV005 (R-Y), RV006 (B-Y): Video PC Board

1) Shoot the color viewer in the way same as in "Adjusting beam voltage" in item 1).
2) Connect an oscilloscope to TP202 on the deflection PC Board.
3) Adjust zoom so that the waveform is clipped.
4) Adjust RV005, RV006 to minimize the carrier. (Note1) Fig. 17.

Note 1. Adjust RV005 and RV006 repeating alternately.

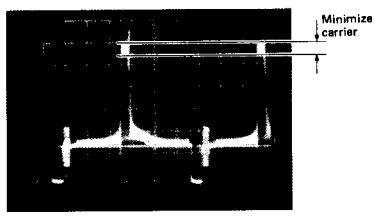


Fig. 17

9. Adjusting black balance

RV002 (R. PED), RV003 (B. PED): Video PC Board

1) Shoot the grey scale chart.
2) Connect an oscilloscope to TP202 on the deflection PC Board.
3) Adjust RV002, RV003 to minimize the carrier.

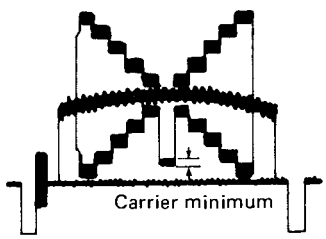


Fig. 18

10. Adjusting set-up

RV001 (PED): Video PC Board

1) Shoot the grey scale chart.
2) Connect an oscilloscope to TP202 on the deflection PC Board.
3) Adjust RV001 so that the waveform level is 50mVp-p.

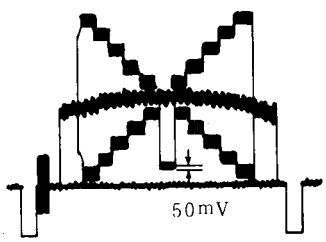


Fig. 19

11. Adjusting white balance

RV302 (R. GAIN), 304 (B. GAIN): Pre-amp unit

1) Shoot the grey scale chart.
2) Connect an oscilloscope to TP202 on the deflection PC Board.
3) Adjust RV302, RV304 to minimize the carrier (80mVp-p or less). (Note 1)

Note 1. Adjust RV302, RV304 repeatedly and alternately.

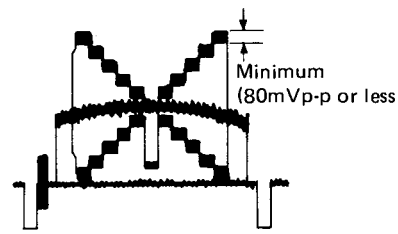


Fig. 20

Confirmation:

1) After adjusting the white balance, confirm that the sections A and B are 80mVp-p or less, the section CB 50mV.
2) If the values shown above cannot be obtained, readjust from item 9 "Adjusting black balance" or check the circuit.

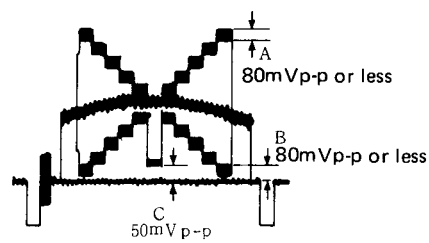


Fig. 21

12. Adjusting crosstalk balance

When this is adjusted on the manufacture line, it scarcely drifts. Adjust this only when RV301 or RV303 is turned by accident or when the color smears conspicuously.

RV301 (R. IMP), 303 (B. IMP): Pre-amp unit

1) Shoot the grey scale chart.
2) Adjust RV301, RV303 so that the color smears around the grey scale of the picture are minimum. (Note 1)
3) Check white balance.

Note 1. With the color control of the TV set turned fully colckwise the color smears can be seen best.

13. Adjusting the level indicator

RV009 (LIS): Video PC Board

1. Shoot the grey scale chart.
2. Connect an oscilloscope to TP202 on the deflection PC Board.
3. Adjust RV011 so that the video signal of the waveform is 0.56Vp-p. Fig. 22
4. Adjust RV009 so that the "L" indicator lights dimly (starts lighting).
5. Adjust auto-iris in item 14.

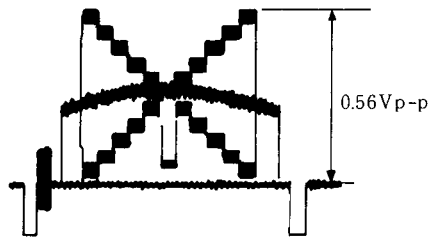


Fig. 22

14. Adjusting auto-iris

RV011 (IRIS): Video PC Board

1) Shoot the grey scale chart.
2) Connect an oscilloscope to TP202 on the deflection PC Board.
3) Adjust RV011 so that the video signal of the waveform is 0.8Vp-p.

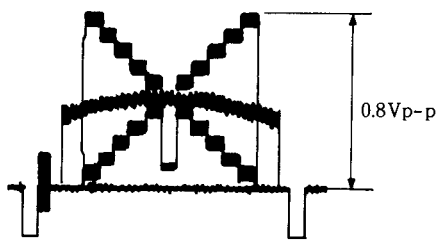


Fig. 23

15. Adjusting white balance indicator

RV008 (CIS): Video PC Board

1) Shoot the grey scale chart.
2) Adjust the white balance control (RV401) to obtain the best white balance.
3) Adjust RV008 with the knob of the white balance control kept pressed to set the "W" indicator to the position where the red light goes off and changes over to green (or to red from green). (Note 1)

Note 1. When balance is out of order when the white balance control knob is pressed, the "W" indicator lights red or green.

16. Adjusting the AGC operation point

RV010 (AGC SET): Video PC Board

1) Shoot the grey scale chart.
2) Set the sensitivity switch to "NORMAL".
3) Set the oscilloscope to the DC range and connect it to TP004 on the Video PC Board.
4) Adjust RV010 to obtain 4.5V ±0.1V. (Note 1)

Note 1. White balance may be spoiled when the AGC operation point is set; re-adjust RV302 and RV-304 of the pre-amp unit at that time.

ADJUSTMENT AFTER REPLACING CRT

1. **Adjusting focus**
   RV209 (VF FOCUS): Deflection PC Board
   1) Shoot the test chart A.
   2) Adjust RV209 so that the picture in the viewfinder is best.

2. **Adjusting centering**
   Centering magnet: CRT deflection coil
   1) Shoot the test chart A.
   2) Adjust the centering magnet so that the center of the picture is set approximately to the center of the viewfinder.
   3) Set the video/camera select switch to "VIDEO".
   4) Apply the PLAY signal from the VTR to check that imperfect raster does not occur.
      When imperfect raster occurs, re-adjust the centering magnet.

3. **Adjusting luminance/contrast**
   RV208 (BRIGHT), RV205 (CONTRAST): Deflection PC Board.
   1) Shoot the grey scale chart.
   2) Adjust RV208, RV205 to make the picture in the viewfinder easy to see. (Note 1)

Note 1. Perform adjustment in the range so that no blooming occurs in the white section of the picture.

4. **Adjusting vertical size**
   RV203 (VF SIZE): Deflection PC Board
   1) Shoot the test chart A.
   2) Adjust RV203 so that the picture in the viewfinder is round.

ADJUSTMENT AFTER REPLACING LENS

1. **Adjusting tilt of black mask, back-focus**
   Tilt of black mask
   1) Shoot the color viewer without the chart inserted.
   2) Loosen the VIDICON tightening screw (Fig. 24).
   3) Press the VIDICON forward until it stops.
   4) Turn RV206 to make black mask appear on the screen. (Fig. 25)
   5) Connect an oscilloscope to TP202 on the deflection PC Board.
   6) Minimize deviation (width) of the leading edge of the waveform. (Fig. 26, 27)

   Back-focus
   1) Shoot the test chart A.
   2) Set the zoom to telephoto (T end).
   3) Turn the focus ring to focus.
   4) Set the zoom to wideangle (W end).
   5) Loosen the back-focus lock screw. (Fig. 24)
   6) Turn the back focus adjusting screw to focus.
   7) Set so that it is in focus when the zoom is set both photo and wide angle.
   8) Tighten the back-focus lock screw after adjustment is completed.

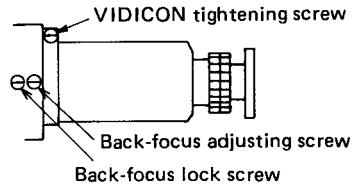


Fig. 24

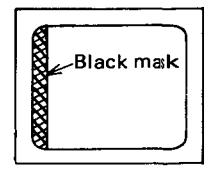


Fig. 25

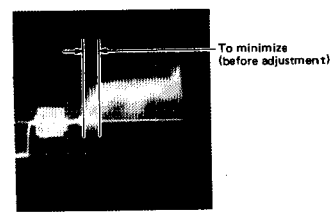


Fig. 26

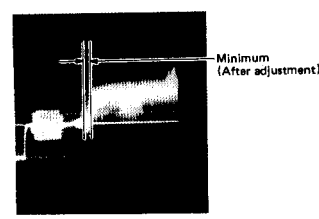


Fig. 27

ADJUSTING CIRCUIT

1. Adjusting power voltage

RV214 (9V ADJ): Deflection PC Board

1) It is not required to shoot both the color viewer and chart.
2) Connect a DC voltmeter to TP003 on the deflection PC Board.
3) Adjust RV214 to set the reading of the voltmeter to 9V.

2. Perform adjustment after replacing the VIDICON.

3. Perform adjustment after replacing the CRT.

4. Adjusting vertical/horizontal hold of the viewfinder.

RV211 (H. HOLD), RV212 (V. HOLD): Deflection PC Board

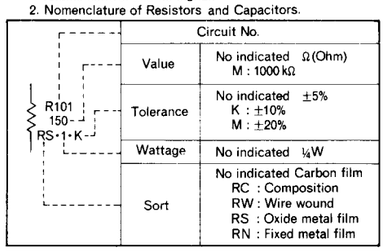
1. Set the video/camera select switch to "VIDEO".
2. Apply the PLAY signal from the VTR.
3. Turn RV211 to adjust horizontal hold. (Note 1)
4. Turn RV212 to adjust vertical hold.

Note 1. Perform adjustment with RV211 turned fully counterclockwise first.

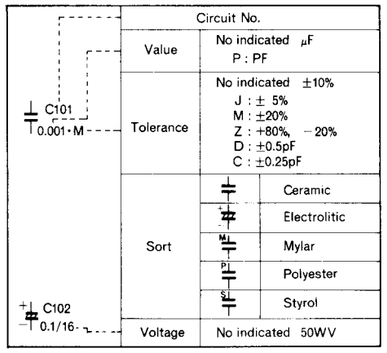
SCHEMATIC DIAGRAMS & CIRCUIT BOARD DIAGRAMS

Note

1. Voltage measured at base of chassis with minimum volume control and no signal.
2. Nomenclature of Resistors and Capacitors.



Circuit No.	
Value	No indicated Ω(Ohm) M : 1000 kΩ
Tolerance	No indicated ±5% K : ±10% M : ±20%
Wattage	No indicated ¼W
Sort	No indicated Carbon film RC : Composition RW : Wire wound RS : Oxide metal film RN : Fixed metal film



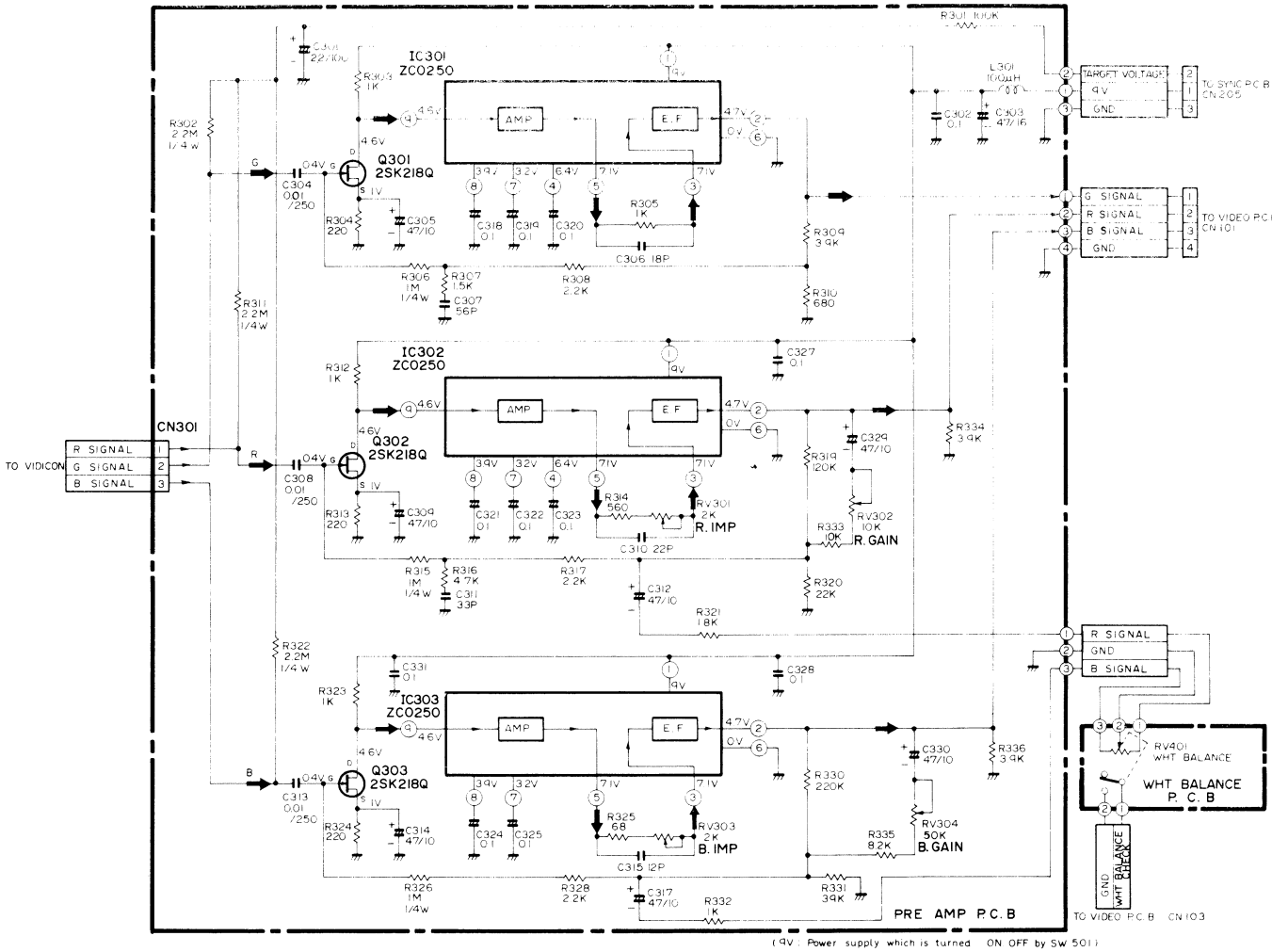
Circuit No.		
Value	No indicated μF P : PF	
Tolerance	No indicated ±10% J : ± 5% M : ±20% Z : +80%, −20% D : ±0.5pF C : ±0.25pF	
Sort		Ceramic
		Electrolitic
		Mylar
		Polyester
		Styrol
Voltage	No indicated 50WV	

3. Be sure to make your orders of resistors and capacitors with value, voltage, tolerance and sort.
4. When replacing capacitors marked with ※, use specified ones stated on parts list since required temperature characteristics.

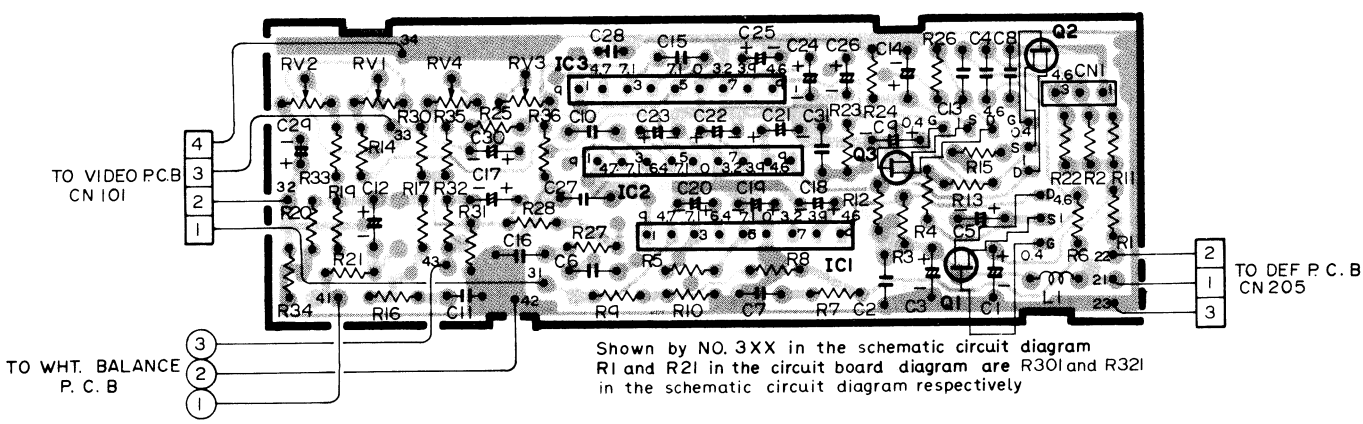
Cautions on use of MOS ICs

1. The MOS IC is inserted in black foam for shipment. This foam is a conductor which short-circuits between the leads to prevent damage. Do not remove ICs from this foam during their storage. Avoid removing ICs from this foam, placing them on plastic which is likely to be charged with static electricity or inserting them into styrol foam.
2. High voltages may be applied during soldering caused by leakages from the soldering iron, so be sure to ground the tip of the soldering iron or use a low voltage soldering iron.
3. The human body, clothes made of synthetic fibres or nylon gloves may be charged with several thousands volts of static electricity because of friction, so workers should be grounded.
4. Be sure to ground measuring instruments such as oscilloscopes, VTVMs, etc. used for repairs.

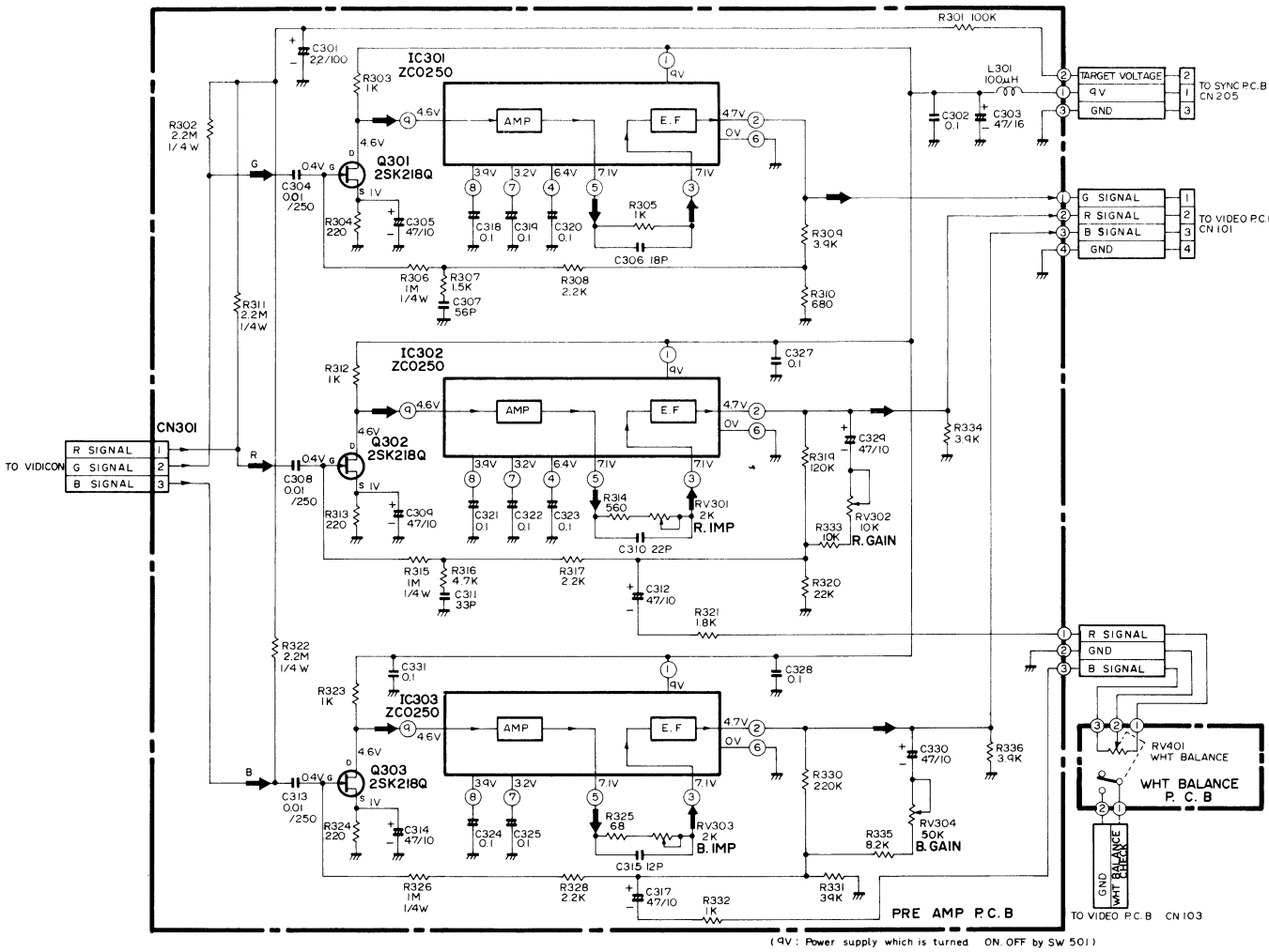
PRE AMP SCHEMATIC DIAGRAM



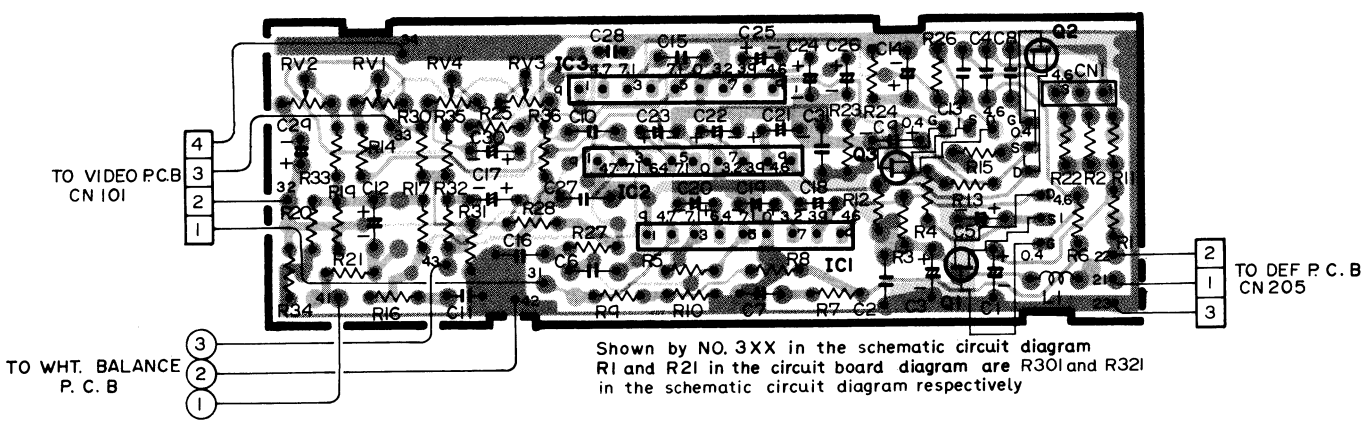
PRE AMP CIRCUIT BOARD DIAGRAM



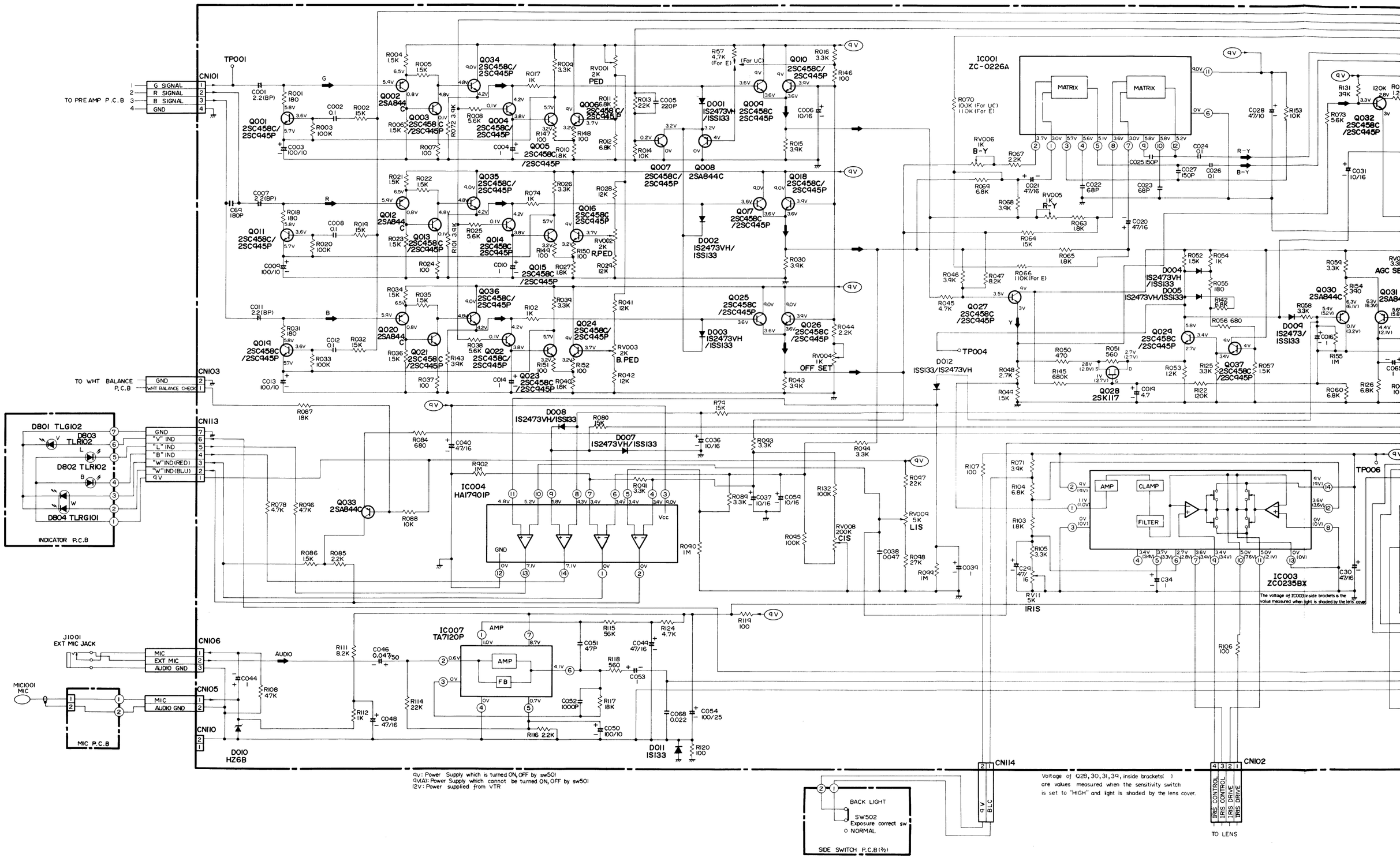
PRE AMP SCHEMATIC DIAGRAM



PRE AMP CIRCUIT BOARD DIAGRAM

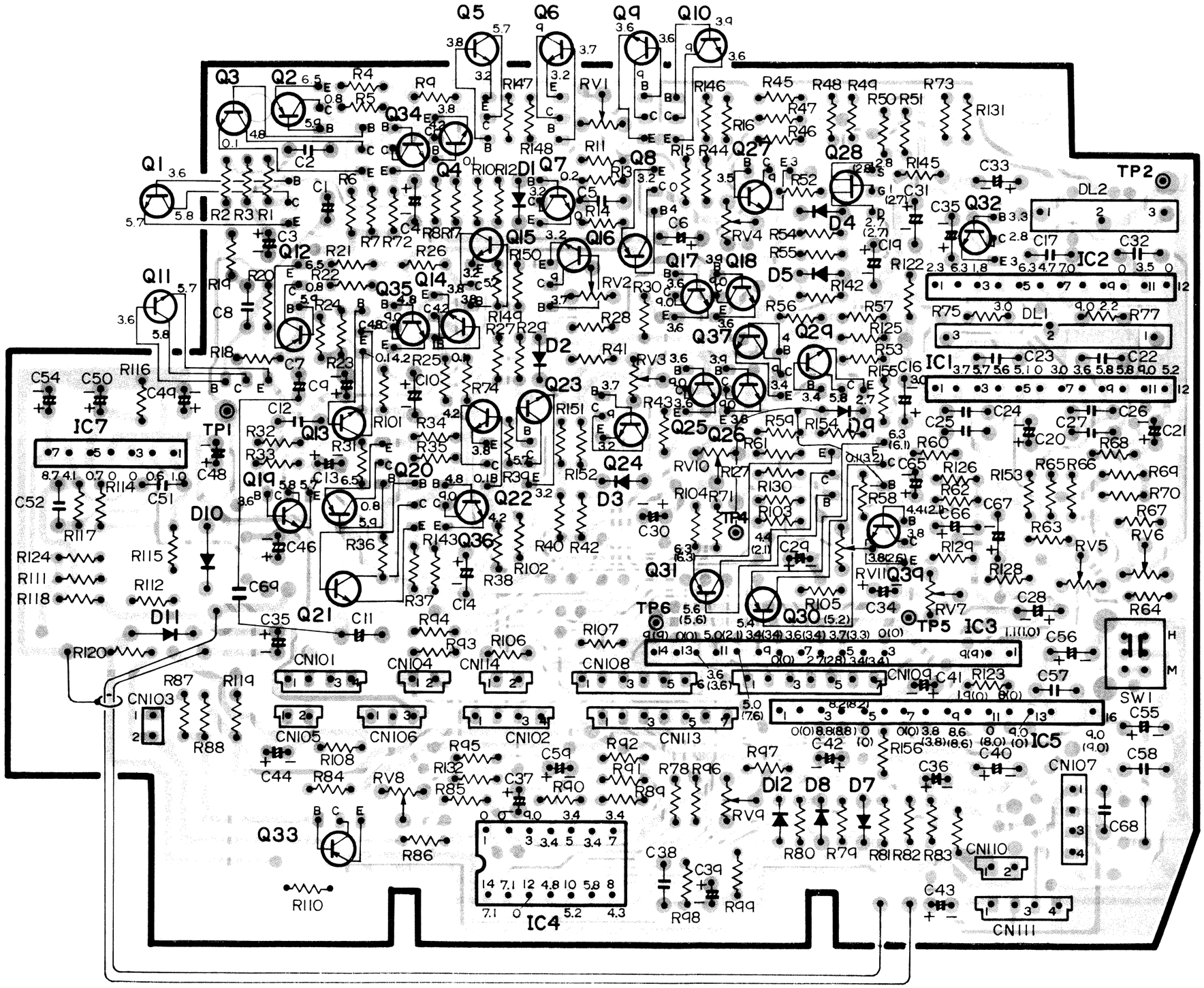

TO VIDEO P.C.B CN 101
TO WHT. BALANCE P. C. B
TO DEF P. C. B CN 205
Shown by NO. 3XX in the schematic circuit diagram
R1 and R21 in the circuit board diagram are R301 and R321
in the schematic circuit diagram respectively

VIDEO SCHEMATIC DIAGRAM

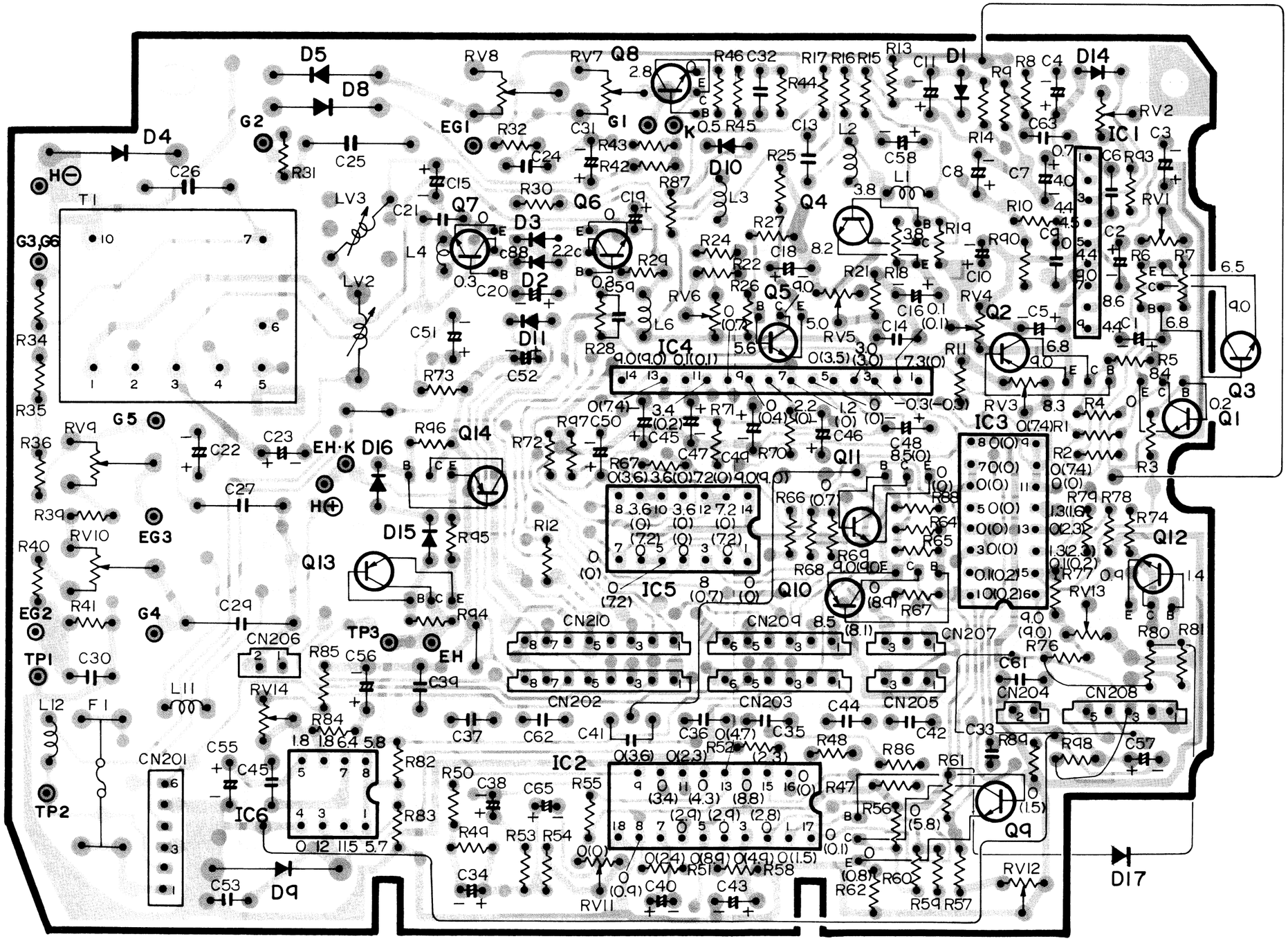


IC001
ZC-0226A
MATRIX
MATRIX
IC002
ZC-0231X
APERTURE
AMP
BUFFER
DL001
DL002
IC003
ZC0235BX
AMP
CLAMP
FILTER
IRIS
The voltage of IC003 inside brackets is the value measured when light is shaded by the lens cover.
IC005
ZC-0260VH
F. F
TRIG
The voltage of IC005 inside brackets( ) is the value measured in the pause mode
Q001 2SC458C/2SC945P
Q002 2SC458C/2SC945P
Q003 2SA844C
Q004 2SC458C/2SC945P
Q005 2SC458C/2SC945P
Q006 2SC458C/2SC945P
Q007 2SC458C/2SC945P
Q008 2SA844C
Q009 2SC458C/2SC945P
Q010 2SC458C/2SC945P
Q011 2SC458C/2SC945P
Q012 2SC458C/2SC945P
Q013 2SC458C/2SC945P
Q014 2SC458C/2SC945P
Q015 2SC458C/2SC945P
Q016 2SC458C/2SC945P
Q017 2SC458C/2SC945P
Q018 2SC458C/2SC945P
Q024 2SC458C/2SC945P
Q025 2SC458C/2SC945P
Q026 2SC458C/2SC945P
Q027 2SC458C/2SC945P
Q028 2SK117
Q029 2SC458C/2SC945P
Q030 2SA844C
Q031 2SA844C
Q032 2SC458C/2SC945P
Q037 2SC458C/2SC945P
Q039 2SC1890AF
D001 IS2473VH/ISS133
D002 IS2473VH/ISS133
D003 IS2473VH/ISS133
D004 IS2473VH/ISS133
D005 IS2473VH/ISS133
D007 IS2473VH/ISS133
D009 IS2473/ISS133
D011 ISS133
D012 ISS133/IS2473VH
RV001 2K PED
RV002 2K R.PED
RV003 2K B.PED
RV004 1K OFF SET
RV005 1K R-Y
RV006 1K B-Y
RV007 100K ASC SET
RV008 200K CIS
RV009 5K LIS
RV010 3.3K AGC SET
RV011 5K IRIS
SW001
SW501 Exposure correct sw
SW502 Exposure correct sw
SW601 Remote control sw
SW701 Sensitivity sw
TP002
TP003
TP004
TP005
TP006
J001
J002
CN104 TRIG P.C.B
CN107 To CAMERA CONNECTOR
CN108 To DEF P.C.B CN203
CN109 To SYNC UNIT
CN111 REAR SWITCH P.C.B (½)
CN102 TO LENS
CN114 SIDE SWITCH P.C.B (½)
VIDEO P.C.B
Voltage of Q28, 30, 31, 39, inside brackets( ) are values measured when the sensitivity switch is set to "HIGH" and light is shaded by the lens cover.
CN109: 3 CP 2; 2 B.GP; 1 CAM. HD; 4 H.BF; 7 Y SIGNAL; 5 R-Y SIGNAL; 6 B-Y SIGNAL
CN108: 1 ASC; 5 RETURN AUDIO; 4 qV; 5 IND. CONT.; 2 qV (A); 3 12V
CN111: 4 GND; 3 SENSITIVITY; 2; 1
CN107: 4 REC qV; 3 TRIG SIGNAL; 2 AUDIO SIGNAL; 1 AUDIO GND
CN104: 2 qV (A); 1 TRIG SIGNAL
CN114: 2 qV; 1 BLC
CN102: 4 IRIS CONTROL; 3 IRIS CONTROL; 2 IRIS DRIVE; 1 IRIS DRIVE
SW701: NORMAL; Sensitivity sw; High
SW601: Remote control sw
SW502: BACK LIGHT; Exposure correct sw; NORMAL
SW501: Exposure correct sw
SW001: H; M
J001
J002

VIDEO CIRCUIT BOARD DIAGRAM

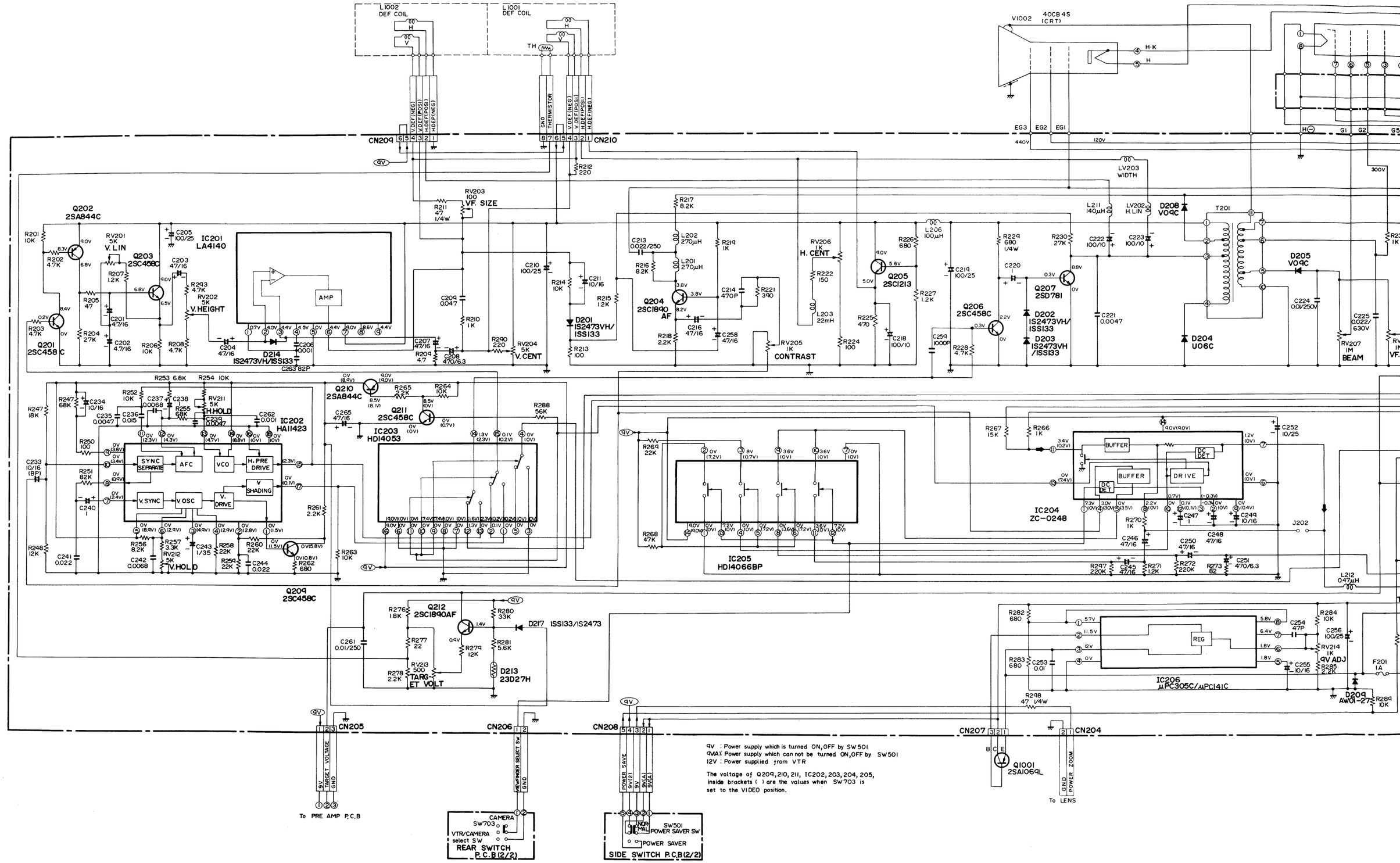


DEF. CIRCUIT BOARD DIAGRAM



Shown by NO. 2XX in the schematic circuit digram IC1 and R82 in the circuit board diagram are IC201 and R282 in the schematic circuit diagram respectively.

DEF. SCHEMATIC DIAGRAM



V1002 40CB4S (CRT)

H·K

H

V1001 HS256 (VIDICON)

R SIGNAL
G SIGNAL
B SIGNAL
To PRE AMP P.C.B CN301

C264 0.0047 /15KV

EG3 EG2 EG1 H⊖ G1 G2 G5 G3·G6 G4 K H⊕ EH·K EH

440V 120V 300V 1KV 600V 190V

CN210

THERMISTOR
V.DEF(NEG)
V.DEF(POS)
H.DEF(POS)
H.DEF(NEG)

R212 220

LV203 WIDTH

L211 140μH

LV202 H.LIN

D208 V09C

T201

D205 V09C

D204 U06C

TP203

Q213 2SC1213A

Q214 2SA673C

D215 IS2473VH/ ISS133

D216 IS2473VH/ ISS133

R244 475

R295 12

R296 1.3K

R217 8.2K

R219 1K

L202 270μH

L201 270μH

C213 0.022/250

R216 8.2K

RV206 1K H. CENT

R222 150

L203 22mH

R214 10K

C211 10/16

R215 1.2K

Q204 2SC1890 AF

C216 47/16

C214 470P

R221 390

C258 47/16

R218 2.2K

RV205 1K CONTRAST

R213 100

D201 IS2473VH/ ISS133

R224 100

R225 470

C218 100/10

Q205 2SC1213

R226 680

L206 100μH

R227 1.2K

C219 100/25

Q206 2SC458C

C259 1000P

R228 4.7K

R229 680 1/4W

C220 1

Q207 2SD781

D202 IS2473VH/ ISS133

D203 IS2473VH /ISS133

R230 27K

C222 100/10

C223 100/10

C221 0.0047

R231 1K

R232 1M 1/4W

C224 0.01/250V

C225 0.022/ 630V

RV207 1M BEAM

R234 1M

R235 1M

R236 1M

RV208 1M VF. BRIGHT

C226 4700P /2KV

C227 4700P /1KV

RV209 1M VF FOCUS

R239 825K

RV210 500K CAM FOCUS

R240 39.2K

R241 619K

C229 0.022 /630

C230 0.022 /250

C231 4.7/100

R242 150K

R243 56K

R244 33K

C232 100P

R245 15K

R246 2.2K

Q208 2SC1890AF

R274 1M

9V

R269 22K

R268 47K

IC205 HD14066BP

R267 15K

R266 1K

IC204 ZC-0248

BUFFER
DRIVE
DC DET

C252 10/25

C247 1

C249 10/16

R270 1K

C246 47/16

C250 47/16

C248 47/16

R297 220K

C245 47/16

R271 1.2K

R272 220K

R273 82

C251 470/6.3

J202

L212 0.47μH

TP201

TP202

CN203

IND. CONT
RETURN AUDIO
9 V
12 V
9 V(A)
ASC

To VIDEO P.C.B CN108

CN201

RETURN AUDIO
GND
RETURN VIDEO
GND
VIDEO SIGNAL
12 V

To CAMERA CONNECTOR

CN202

9 V
VIDEO SIGNAL
CAM. HD
B.GP
SYNC
GND
GND

REG 7V

SYNC SIGNAL OSC

OSC

ENCODER

VIDEO

SC(R-Y)
SC(B-Y)
BF
BL
CP

R-Y
Y
B-Y

SYNC UNIT

CAM.HD
B.GP
CP2
H.BF

Y
B-Y
R-Y
H. BF
CP2
B.GP
CAM. HD

To VIDEO P.C.B CN109

R282 680

R283 680

C253 0.01

REG

IC206 μPC305C/μPC141C

C254 47P

C256 100/25

R284 10K

RV214 1K 9V ADJ

R285 2.2K

C255 10/16

R286 3.3K

F201 1A

D209 AW01-27

R289 10K

R298 47 1/4W

ISS133/IS2473

CN208

POWER SAVE
9V(2)
9V
9V(A)
9V(A)

SW501 POWER SAVER SW

NORMAL

POWER SAVER

SIDE SWITCH P.C.B(2/2)

CN207

B C E

Q1001 2SA1069L

CN204

GND
POWER ZOOM

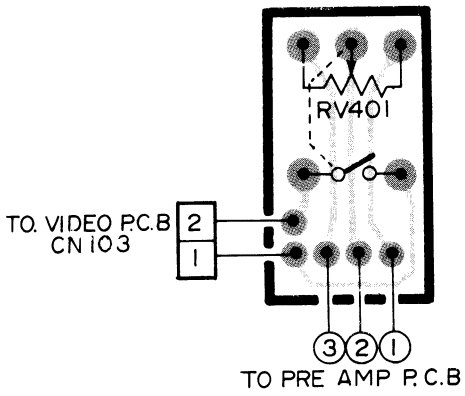
To LENS

DEF P.C.B

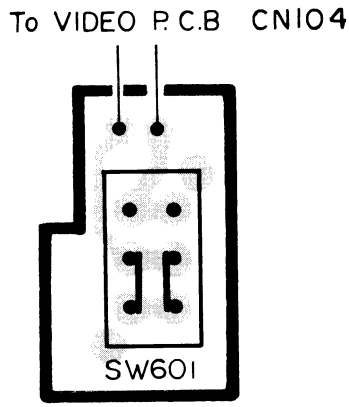
9V : Power supply which is turned ON,OFF by SW501
9V(A): Power supply which can not be turned ON,OFF by SW501
12V : Power supplied from VTR

The voltage of Q209, 210, 211, IC202, 203, 204, 205, inside brackets ( ) are the values when SW703 is set to the VIDEO position.

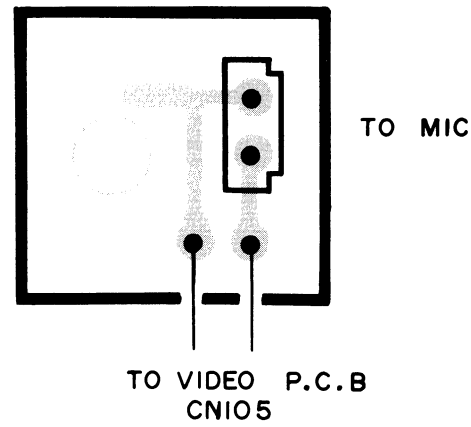
WHITE BALANCE P.C.B.



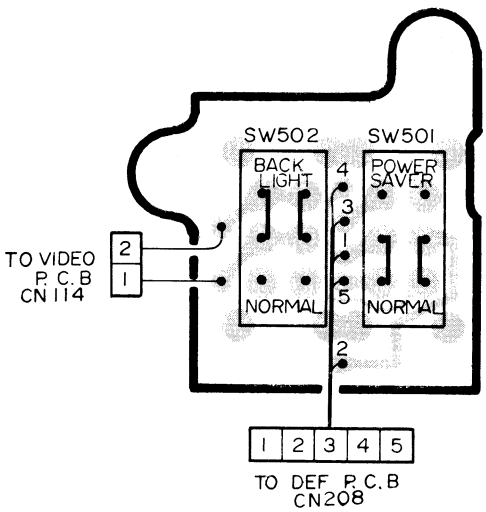
TRIGGER P.C.B.



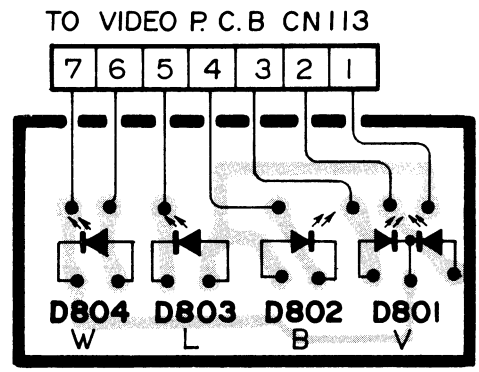
MIC P.C.B



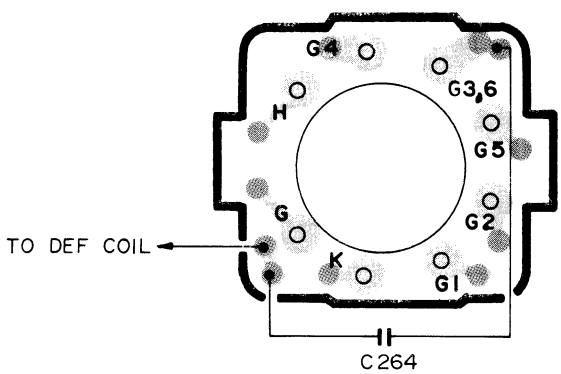
SIDE SWITCH P.C.B.



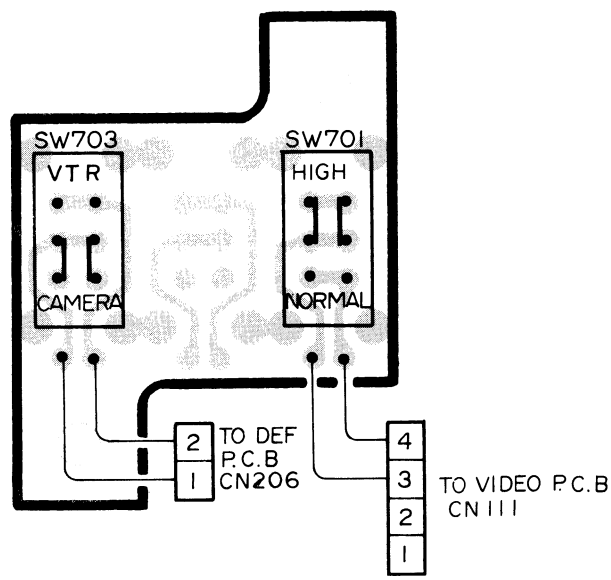
INDICATOR P.C.B.



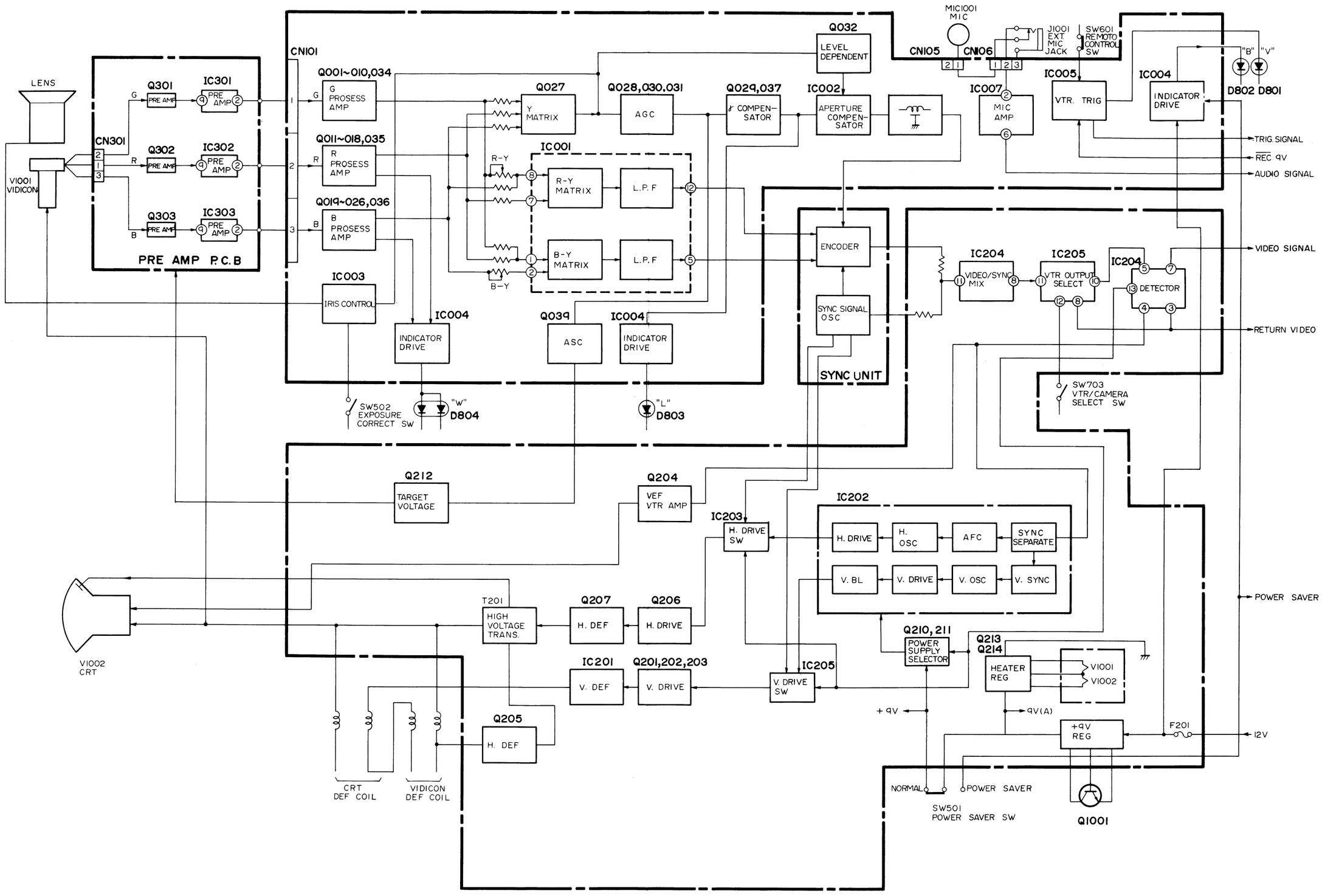
SOCKET P.C.B.



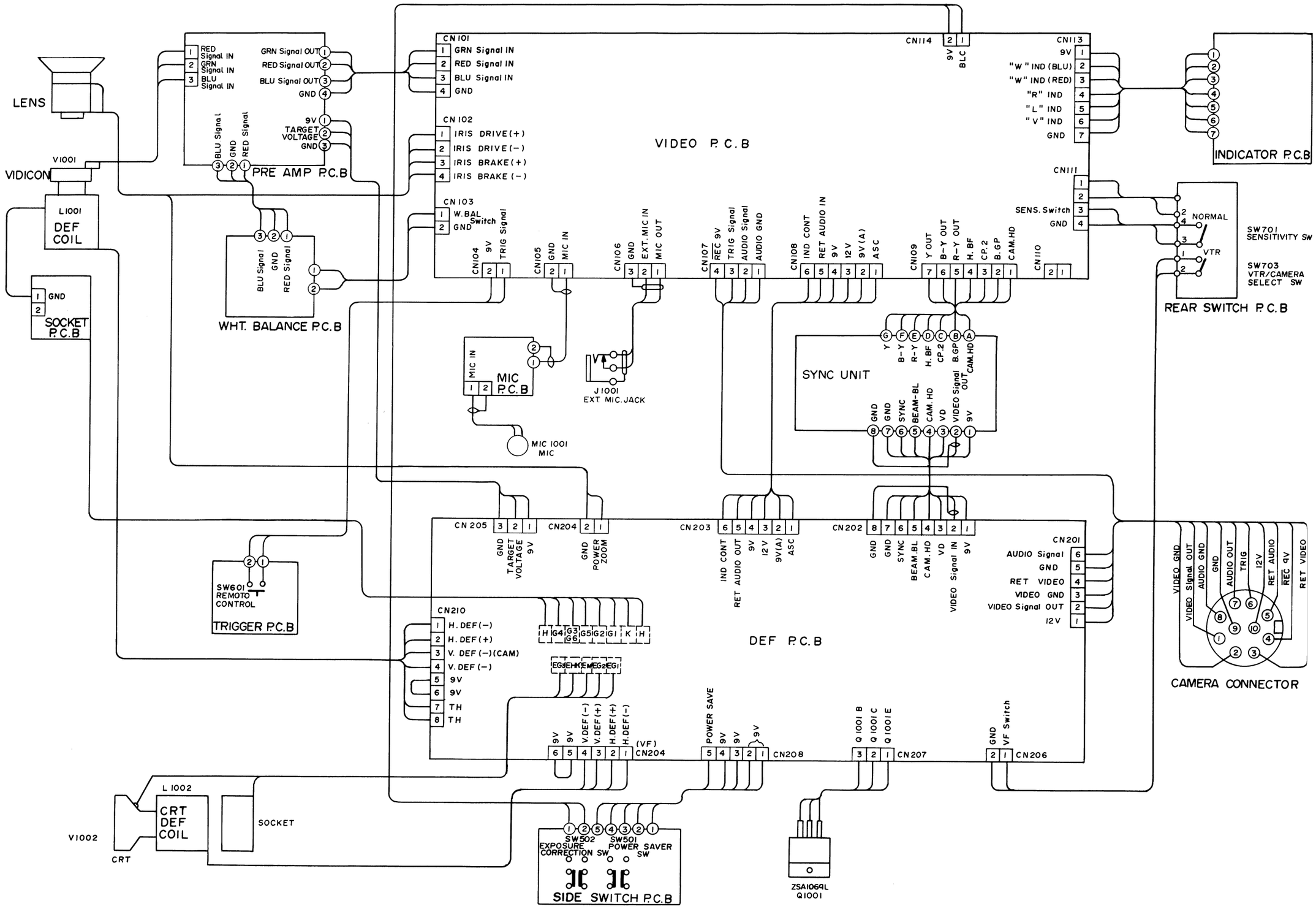
REAR SWITCH P.C.B.



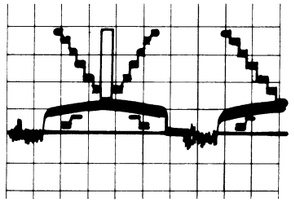
BLOCK DIAGRAM



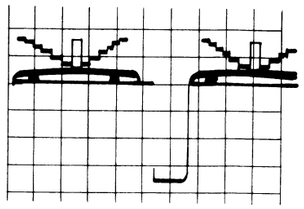
CIRCUIT BOARD CONNECTION DIAGRAM



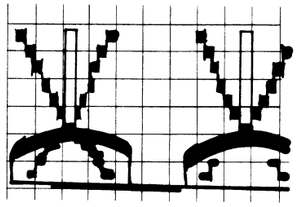
VIDEO CIRCUIT WAVEFORM



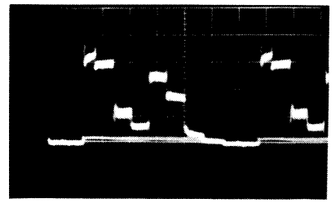
TP001
0.2V/div (Gray scale)



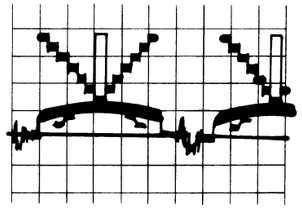
Q025 (B)
1V/div (Gray scale)



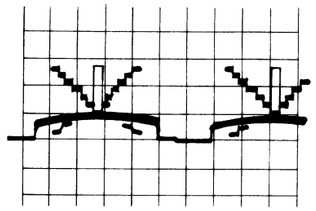
Q027 (E)
0.2V/div (Gray scale)



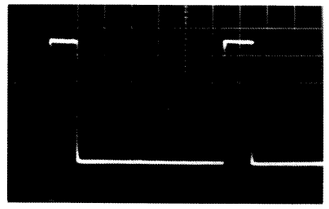
CN109 7
0.5V/div (Color-bar)



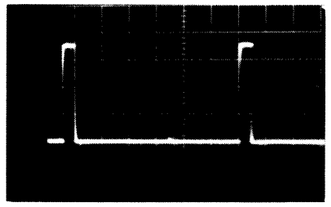
CN101 2
0.2V/div (Gray scale)



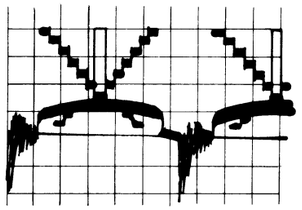
Q010 (E)
0.5V/div (Gray scale)



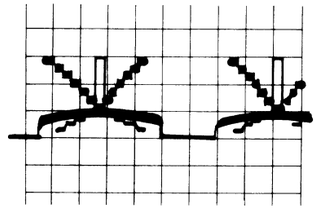
CN109 1
2V/div (CAM. HD)



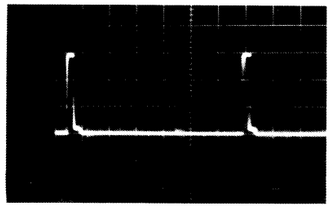
CN109 4
2V/div (H. BF)



CN101 3
0.2V/div (Gray scale)

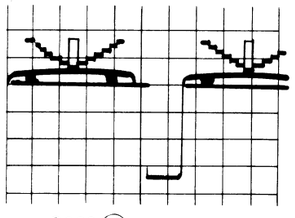


Q018 (E)
0.5V/div (Gray scale)

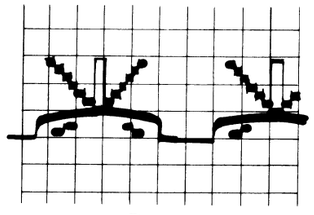


CN109 3
2V/div (CP 2)

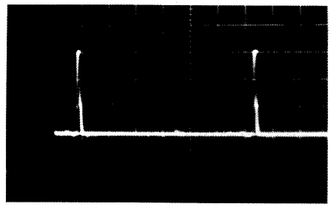
CN109 5
0.5V/div (Color-bar)



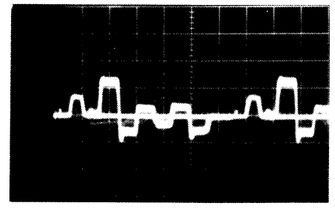
Q009 (B)
1V/div (Gray scale)



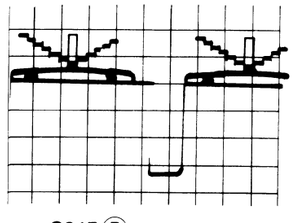
Q026 (E)
0.5V/div (Gray scale)



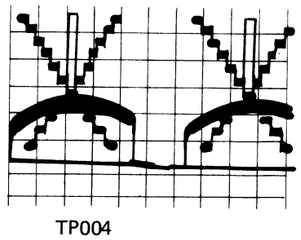
CN109 2
2V/div (B. GP)



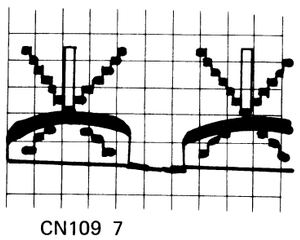
CN109 6
0.5V/div (Color-bar)



Q017 (B)
1V/div (Gray scale)

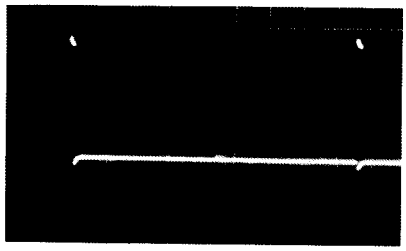


TP004
0.2V/div (Gray scale)

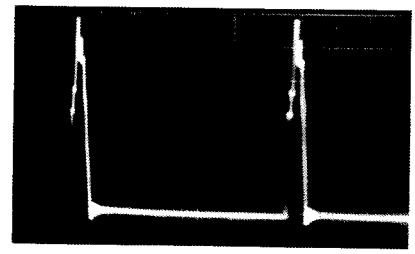


CN109 7
0.2V/div (Gray scale)

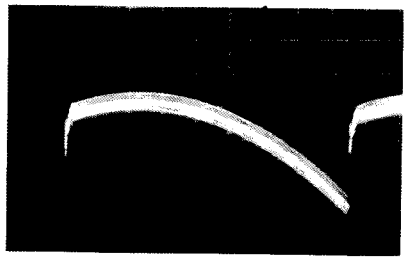
DEF. CIRCUIT WAVEFORM



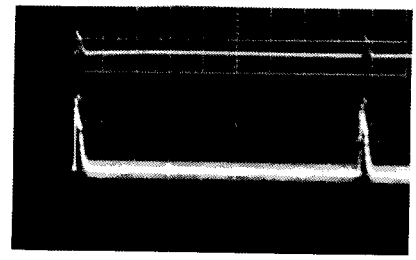
IC203
2V/div (VD)



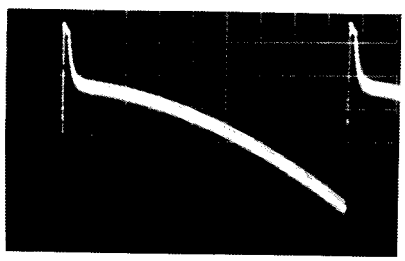
CN209 2
20V/div (H. DEF) CRT



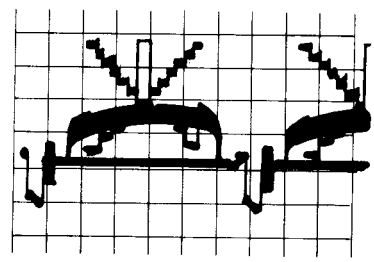
CN209 4
0.5V/div (V. DEF) CRT



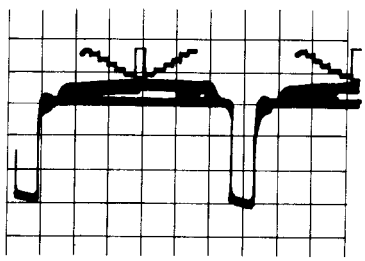
Q204 (B)
0.5V/div



IC201 6
1V/div (V. DEF) CRT

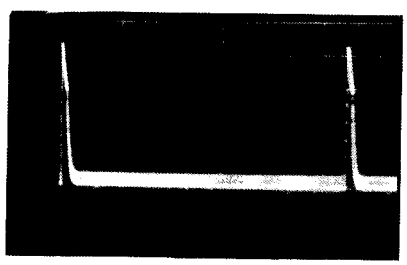


IC204 4
0.2V/div (Gray scale)

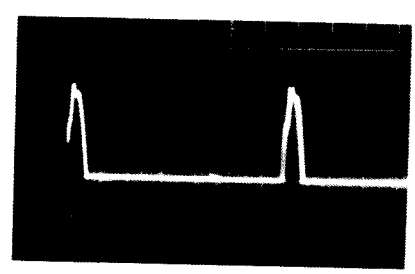


CRT SOCKET 3.7
10V/div (Gray scale)

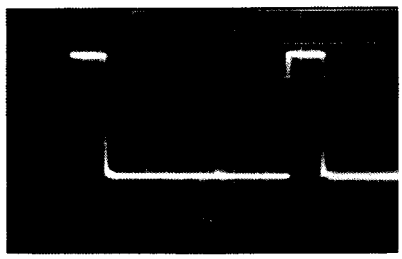
CN210 2
10V/div (H. DEF) VIDICON



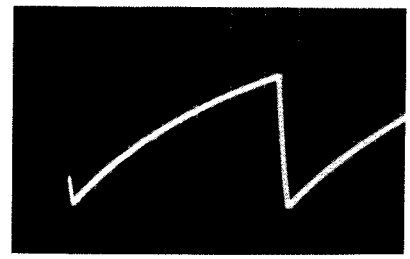
D201 Cathode
0.5V/div



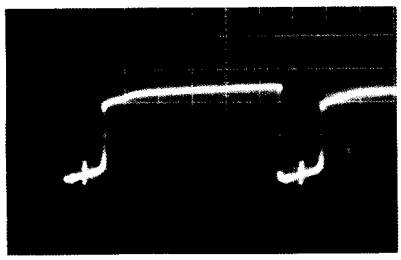
Q207 (C)
50V/div



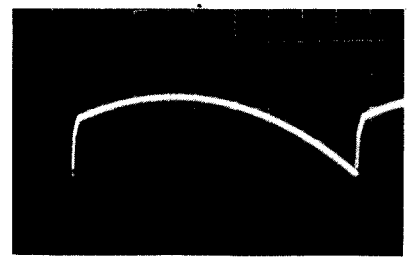
IC203 14
2V/div (HD)



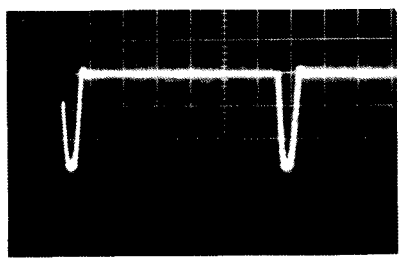
IC202 13
1V/div



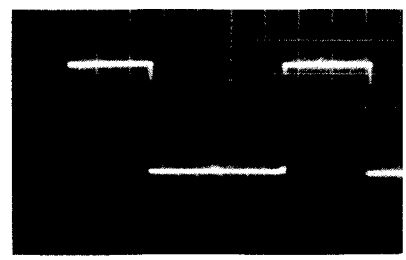
Q207 (B)
1V/div



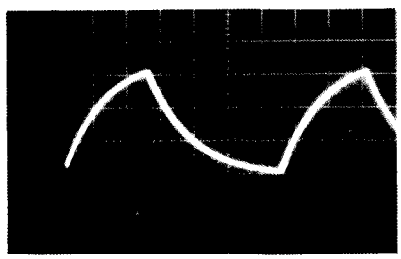
CN210 4
0.5V/div (V. DEF) VIDICON



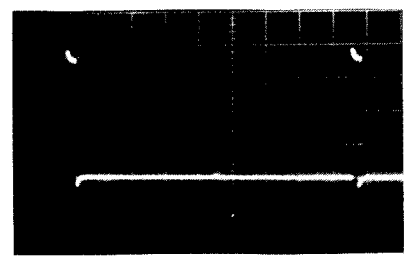
T201 5
50V/div



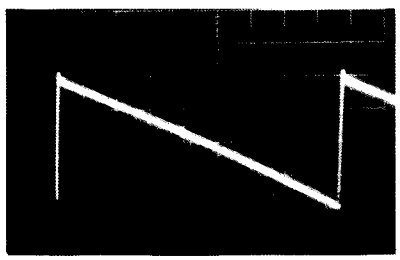
IC202 15
2V/div



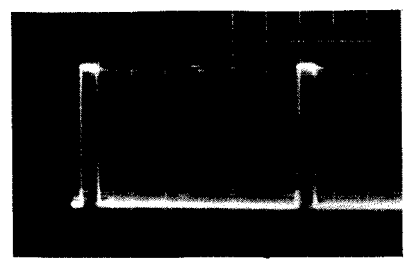
IC202 11
0.5V/div



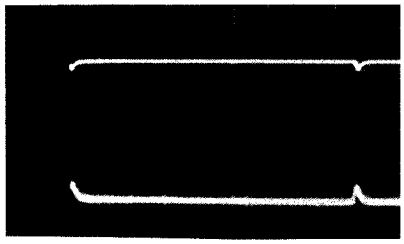
IC202 17
2V/div



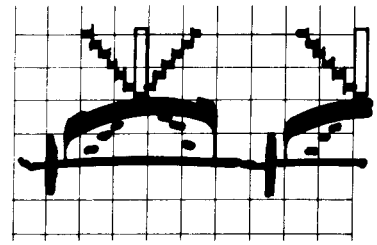
Q203 (E)
0.5V/div



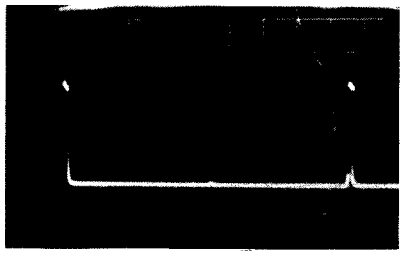
IC202 8
2V/div
(H Period)



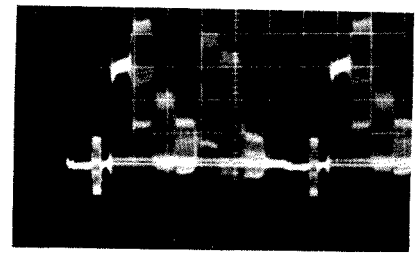
IC202 8
2V/div
V Period



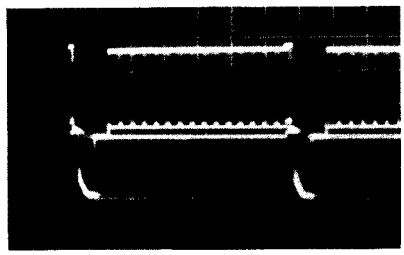
CN202 2
0.5V/div (Gray scale)



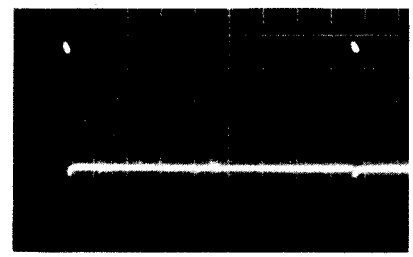
IC202 6
1V/div



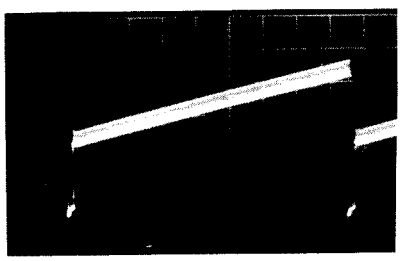
CN202 2
0.5V/div (Color-bar)



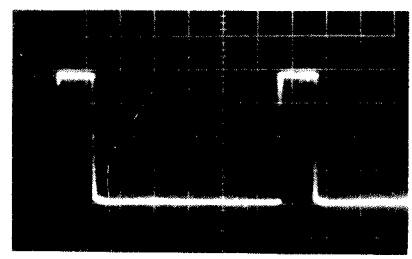
IC202 10
0.2V/div (Grate signal)



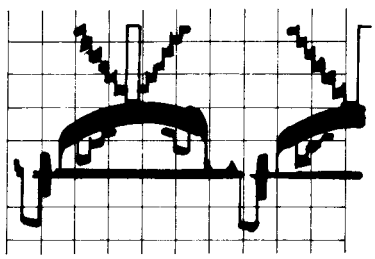
CN202 3
2V/div (VD)



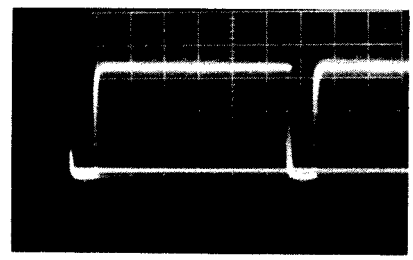
IC202 1
0.5V/div



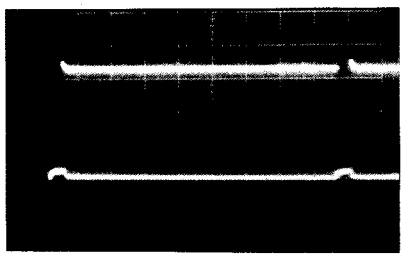
CN202 4
2V/div (CAM. HD)



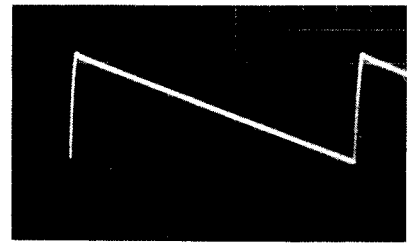
TP202
0.2V/div (Gray scale)



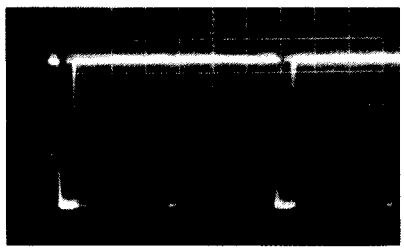
CN202 5
2V/div (BEAM. BL)
(H Period)



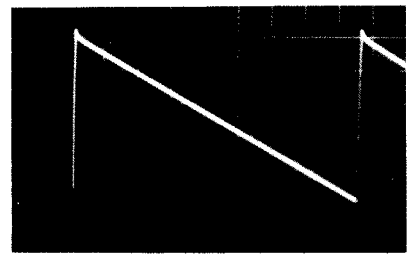
CN202 5
2V/div (BEAM BL)
(V Period)



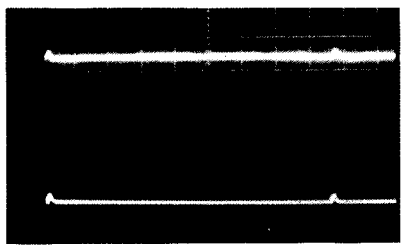
IC202 2
0.5V/div



CN202 6
2V/div (SYNC)
(H Period)



IC202 3
0.5V/div



CN202 6
2V/div (SYNC)
(V Period)

REPLACEMENT PARTS LIST

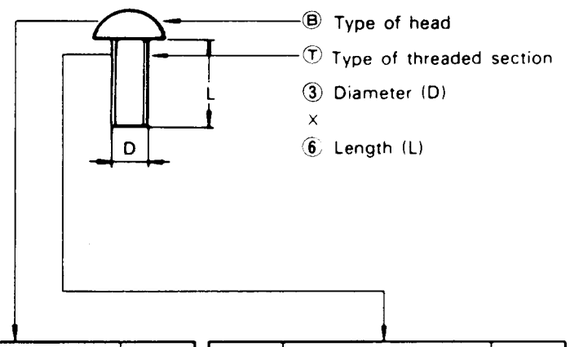
SYMBOL-NO	P-NO	DESCRIPTION
		RESISTORS
RV 1-3	5007513	SEMI VARIABLE 2KOHM
RV 4-6	5007512	SEMI VARIABLE 1KOHM
RV 7	5007515	SEMI VARIABLE 100KOHM
RV 8	5007516	SEMI VARIABLE 200KOHM
RV 9-11	5007514	SEMI VARIABLE 5KOHM
RV201-202	5007514	SEMI VARIABLE 5KOHM
RV203	5007517	SEMI VARIABLE 100OHM
RV204	5007514	SEMI VARIABLE 5KOHM
RV205-206	5007512	SEMI VARIABLE 1KOHM
RV207-208	5008439	VARIABLE RESISTOR 1M OHM
RV209	5007521	SEMI VARIABLE 1MOHM
RV210	5007522	SEMI VARIABLE 500KOHM
RV211-212	5007514	SEMI VARIABLE 5KOHM
RV213	5007511	SEMI VARIABLE 500OHM
RV214	5008439	VARIABLE RESISTOR 1M OHM
		SEMI-CONDUCTORS
D 1-9	5330573	DIODE 1S2473
D201-203	5330573	DIODE 1S2473
D204	5330691	DIODE V06C
D205	5330421	DIODE SILICON V09C 15K
D206	5330421	DIODE 15K SILICON V09C (For E)
D208	5330421	DIODE SILICON V09C (For U, C) 15K
D209	9999999	DIODE AW01-27
D213	5340212	THERMISTOR
D214-216	5330573	DIODE 1S2473
IC 1	5353441	IC ZC-0226A
IC 2	5351849	IC ZC-0231X
IC 3	5353421	IC ZC-0235BX
IC 4	5352901	IC HA17901P
IC 5	5353411	IC ZC-0260VH
IC 7	5351684	IC TA7120P
IC201	5351689	IC LA4140
IC202	5352902	IC HA11423
IC203	5365911	IC HD14053
IC204	5353431	IC ZC-0248
IC205	5365491	IC HD14
IC206	5352553	IC MPC305C
Q 1	5320023	TRANSISTOR 2SC458LGC
Q 2	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q 3-7	5320023	TRANSISTOR 2SC458LGC
Q 8	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q 9-11	5320023	TRANSISTOR 2SC458LGC
Q 12	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW

SYMBOL-NO	P-NO	DESCRIPTION
Q 13-19	5320023	TRANSISTOR 2SC458LGC
Q 20	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q 21-27	5320023	TRANSISTOR 2SC458LGC
Q 28	5322235	TRANSISTOR 2SK117BL
Q 29	5320023	TRANSISTOR 2SC458LGC
Q 30-31	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q 32	5320023	TRANSISTOR 2SC458LGC
Q 33	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q 34-37	5320023	TRANSISTOR 2SC458LGC
Q 39	5322234	TRANSISTOR 2SC1890A-F
Q1001	5322646	TRANSISTOR 2SB859C
Q201	5320023	TRANSISTOR 2SC458LGC
Q202	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q203	5320023	TRANSISTOR 2SC458LGC
Q204	5322234	TRANSISTOR 2SC1890A-F
Q205	5320613	TRANSISTOR 2SC1213C
Q206	5320023	TRANSISTOR 2SC458LGC
Q207	5322238	TRANSISTOR 2SD781
Q208	5322234	TRANSISTOR 2SC1890A-F
Q209	5320023	TRANSISTOR 2SC458LGC
Q210	5321251	TRANSISTOR SILICON 2SA844C 200MHZ 200MW
Q211	5320023	TRANSISTOR 2SC458LGC
Q212	5322234	TRANSISTOR 2SC1890A-F
Q213	5320613	TRANSISTOR 2SC1213C
Q214	5320593	TRANSISTOR 2SA673C
		TRANSFORMERS
T201	5490081	TRANSFORMER
		COILS
LV202	5150614	COIL
LV203	5270262	COIL
L201-202	5152441	CHOKE COIL
L203	5152442	COIL
L206	5150619	COIL
L212	5152411	COIL
		MISCELLANEOUS
	5659511	SOCKET-CRT
	5722201	HOLDER-FUSE
	6959591	LENS
CN211	5659275	SOCKET
DL 1	5270274	DELAY LINE
DL 2	5270273	DELAY LINE
F201	5721188	FUSE
J 1	5672061	MIC JACK
K 1	5897656	CAMERA CABLE

SYMBOL-NO	P-NO	DESCRIPTION
L 1	5272081	COIL ASSEMBLY
L 2	5272071	COIL
MIC 1	5421741	MICROPHONE
SW 1	5622081	SWITCH
V 1	5310255	VIDICON
V 2	5310512	CRT
		FOR FINAL ASSEMBLY
2	6864391	HOLDER-P.C.B
3	7470841	HOLDER-MIC JACK
4	7342061	BRACKET
5	6288781	KNOB
7	7342051	COVER
8	6864341	FILTER ASSEMBLY
9	6535221	SPRING
10	6635331	COVER-SWITCH
11	4661201	LABEL (For U, C)
	4661202	LABEL (For E)
13	6864501	EYE CAP
14	6864511	HOLDER-CRT
15	6864521	GRIP ASSEMBLY
16	6864352	PANEL-REAR
17	6864362	SIDE COVER-R
18	6864372	SIDE COVER-L (For U, C)
	6864373	SIDE COVER-L (For E)
19	6864382	COVER-TOP (For U, C)
	6864381	COVER-TOP (For E)
20	6864481	LENS CAP
21	6864491	LENS HOOD
22	5986854	UNIT-SIDE SWITCH
23	5986853	UNIT-RESISTOR
24	5986855	UNIT-MICROPHONE
25	5986857	UNIT-PRE AMP
26	5986856	UNIT-TRIG SWITCH
29	5993854	UNIT-SYNC (For U, C)
	5993855	UNIT-SYNC (For E)

SCREW CLASSIFICATION

Example: BT3 × 6



Abbreviation	Name	Shape
No symbol	Brazier head	
P	Pan head	
B	Binding head	
O	Oval countersunk head	
F	Flat countersunk head	

Abbreviation	Name	Shape
No symbol	Machine (clamps without tapping)	
t	Tapping (clamps with tapping) Type 1	
T	Tapping (clamps with tapping) Type 2	
f	Forming tight (for metal)	

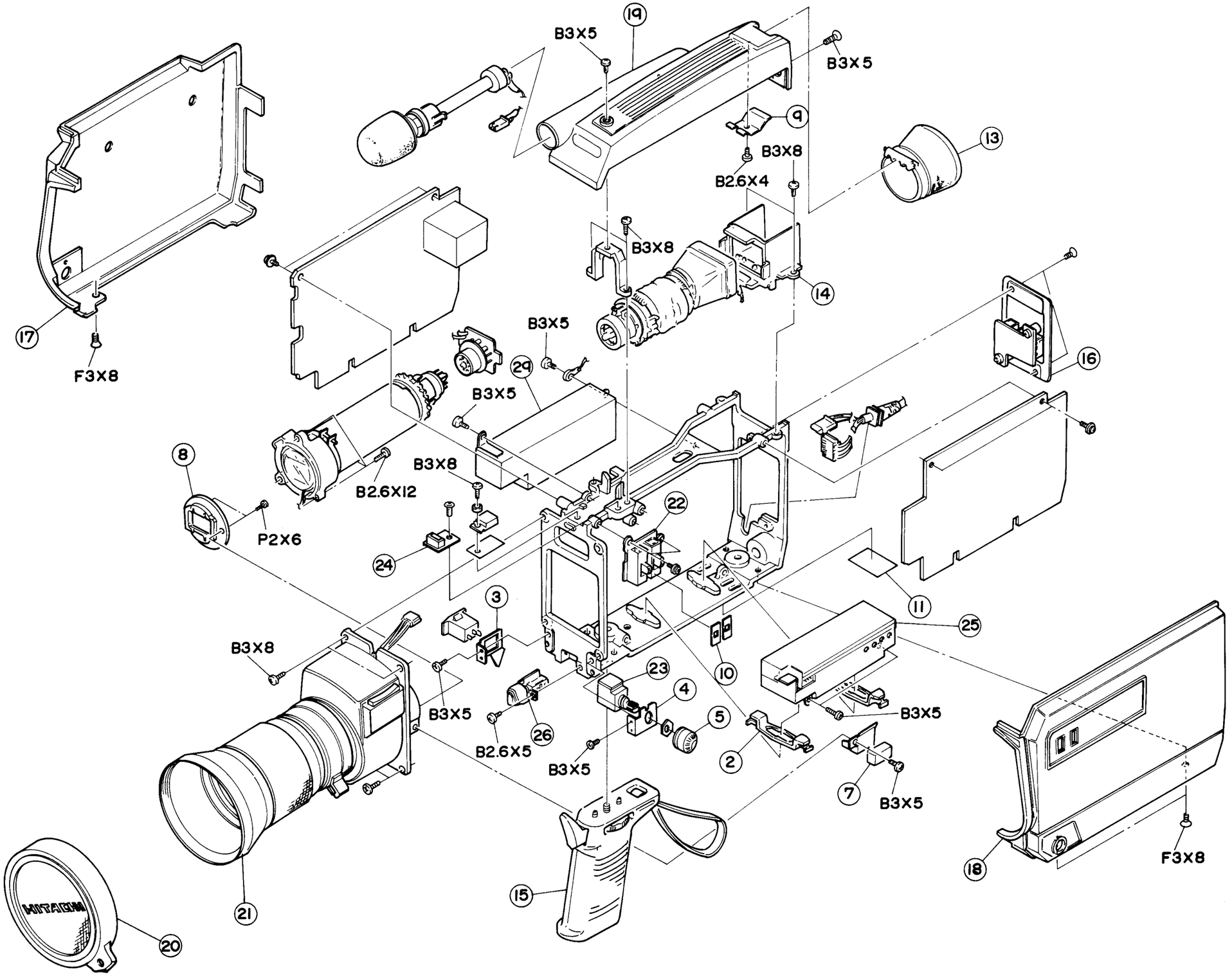
Note: Since the forming tight screw tightens while self-tapping, machine screws can be replaced by tapping screws.

Washers and Nuts

Abbreviation	Name	Shape
W SW LW	Washer Spring washer Locking washer	
E	E-ring	
N	Nut	

Note: Internal dia. is indicated for nuts and washers.

EXPLODED VIEW



HITACHI SALES CORPORATION OF AMERICA
Eastern Regional Office
1200 Wall Street West, Lyndhurst, New Jersey 07071
Tel. 201-935-8980
Mid-Western Regional Office
1400 Morse Ave., Elk Grove Village, III. 60007
Tel. 312-593-1550
Southern Regional Office
510 Plaza Drive College Park, Georgia 30349
Tel. 404-763-0360
Western Regional Office
401 West Artesia Boulevard, Compton, California 90220
Tel. 213-537-8383

HITACHI SALES CORPORATION OF HAWAII, INC
3219 Koapaka Street, Honolulu, Hawaii 96819, U.S.A.
Tel. 808-836-3621

HITACHI SALES CORP. OF CANADA Ltd.
3300 Trans Canada Highway Pointe Claire, Quebec, H9R1B1, Canada
Tel. 514-697-9150

HITACHI SALES EUROPA GmbH
2 Hamburg 54, Kleine Bahnstraße 8, West Germany
Tel. 850 60 71-75

HITACHI SALES (U.K.) Ltd.
Hitachi House, Station Road, Hayes, Middlesex UB3 4DR, England
Tel. 01-848-8787 (Service Centre : 01-848-3551)

HITACHI SALES SCANDINAVIA AB
Rissneleden 8, Sundbyberg, Box 7138, S-172-07 Sundbyberg 7, Sweden
Tel. 08-98 52 80

HITACHI SALES NORWAY A/S
Oerebekk 1620 Gressvik P.O. Box 46 N-1601 Fredrikstad, Norway
Tel. 032-28050

SUOMEN HITACHI OY
Box 151, SF-15100 Lahti 10, Finland
Tel. Lahti 44 241

HITACHI SALES A/S
Kuldyssen 13, DK-2630 Taastrup, Denmark
Tel. 02-999200

HITACHI SALES A.G.
5600 Lenzburg, Switzerland
Tel. 064-513621

HITACHI-FRANCE (Radio-Télévision Electro-Ménager) S.A.
9, Boulevard Ney 75018, Paris, France
Tel. 201-25-00

HITACHI SALES WARENHANDELS GMBH
A-1180/Wien, Kreuzgasse 27
Tel. (0043222) 439367/8

HITACHI

VK-C600(U,C),E TK No. 1570E TOKAI

Printed in Japan YH-N (K)

HITACHI
SERVICE MANUAL

TK | No. 1571E

VK-C600(U,C),E

Technical Information

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

COLOR VIDEO CAMERA

June 1981 **TOKAI WORKS**

CONTENTS

1. OUTLINE 3
2. VIDICON 3
2-1 Construction of VIDICON 3
2-2 Tri-electrode system 4
2-3 Operation principle of VIDICON 4
2-3-1 Operation when incident light is not present . 5
2-3-2 Operation when incident light is present 5
2-4 Various characteristics of VIDICON 5
2-4-1 Dark current and target voltage 5
2-4-2 Photo-conductive sensitivity characteristics . . 5
2-4-3 Beam amount 5
2-4-4 Burning and remaining image 5
2-4-5 Service life of VIDICON 5
2-4-6 Handling VIDICON 5
3. OPERATIONS OF PARTS 6
3-1 Video PC Board 6
3-1-1 Video circuit 6
(1) Pre-amplifier circuit 6
(2) Process circuit 6
(2)-1 Clamp circuit 8
(2)-2 Liner clip circuit 8
(3) Y matrix, AGC, γ circuits 8
(4) ASC circuit 9
(5) Multiplex/LPF circuit 10
3-1-2 VTR trigger circuit 11
3-1-3 Battery indicator circuit 12
3-1-4 Level indicator circuit 12
3-1-5 White balance indicator circuit 13
3-1-6 Audio amp. circuit 13
3-2 Sync unit (ZC-0247AN)
(ZC-0247AP for VK-C600E) 14
3-2-1 Sync circuit 15
3-2-2 Color modulation/video output circuit 17
(1) Video output circuit 17
(2) BL, BF mix circuit 17
(3) SC amplifier circuit 18
(4) Modulation circuit 18
3-3 Deflection circuit 19
3-3-1 Horizontal deflection circuit 19
3-3-2 Vertical deflection circuit 20
3-3-3 Viewfinder video amp. circuit 21
3-3-4 AFC circuit 21
3-3-5 Video output select/video
SYNC mix and buffer circuits 22

Abbreviation	Name	Remarks
B. GP	Black gate pulse	
$\overline{\text{BEAM BL}}$	Beam blanking	
BF	Burst flag	
BL	Blanking	
CP 1	Clamp pulse No. 1	(Used in Modulation circuit)
CP 2	Clamp pulse No. 2	(Used in Process circuit)
CAM. HD	Camera horizontal drive	
C. BLK	Camera blanking	
$\overline{\text{C. SYNC}}$	Composite sync	
H. BF	Horizontal burst flag	
H. BL	Horizontal blanking	
H. DEF	Horizontal deflection	
HD	Horizontal drive	
Pre BLK	Pre-blanking	
SYNC	Sync signal	
SC	Sub-carrier	
VD	Vertical drive	
V. BL	Vertical blanking	
Y. BL	Y Blanking	

When – is above the symbol, it shows a circuit which uses a negative pulse.

1. OUTLINE

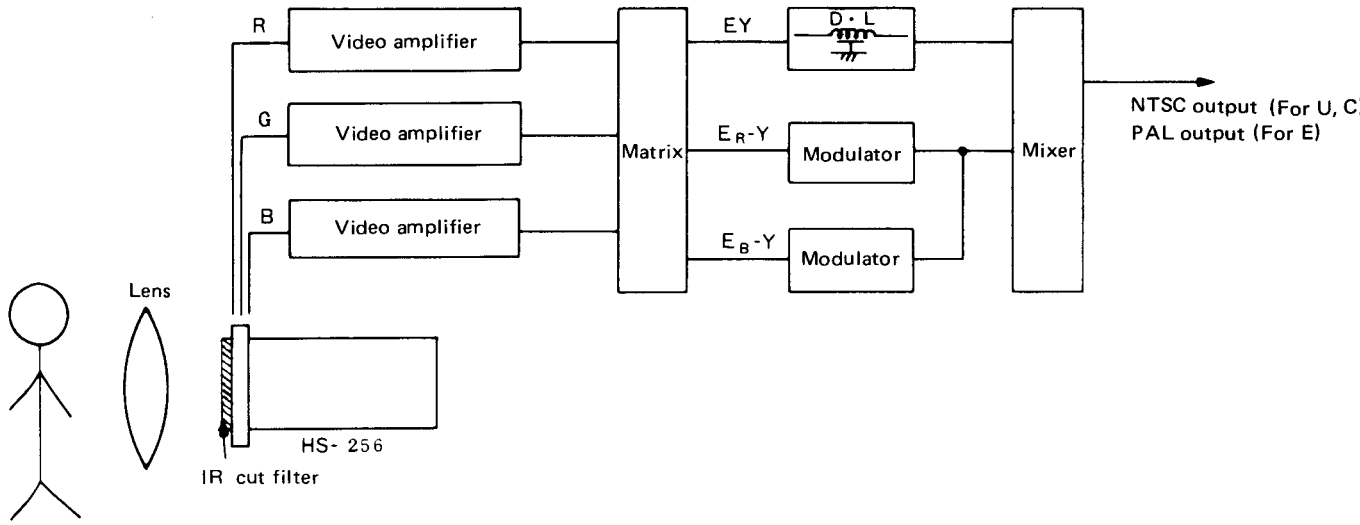


Fig. 1-1

VK-C600 is a tri-electrode color video camera. Fig. 1-1 is its basic block diagram. Light which passes through the lens passes through the IR (infrared) cut filter and the stripe filter attached to the light receiving section of the camera tube (VIDICON), and focuses the optical image on the target. The IR (infrared) filter is provided to remove the signal appearing on the target because of infrared rays outside the visual spectrum. The target surface is arranged corresponding to the stripe filter and is separated and connected to 3 electrodes (R, G, B) by the bus bar. The signal processing thereafter is almost the same as that in a three-tube camera.

2. VIDICON

2—1 Construction of VIDICON

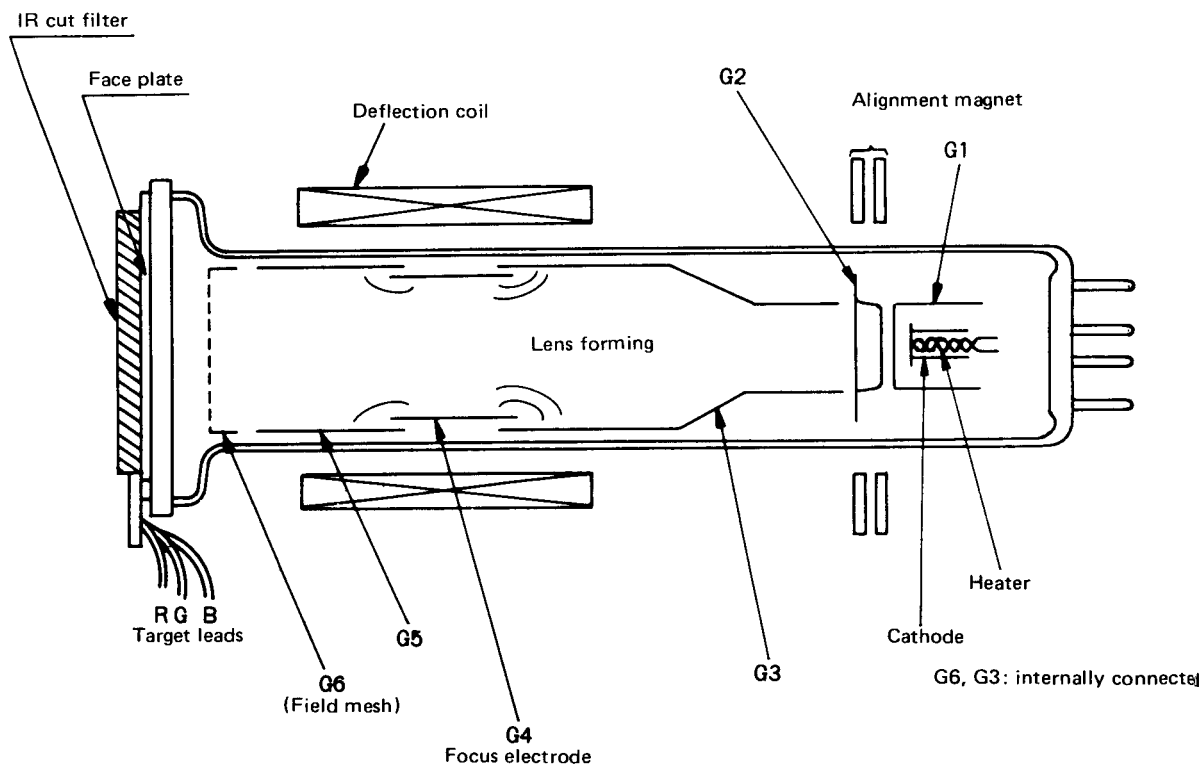


Fig. 2-1 Construction of VIDICON

Fig. 2-1 shows the construction of the VIDICON. The optical flat plate at the end of the glass tube is called the face plate. The optical image is focused on this face plate. The face plate and the glass tube are cold-sealed by compression with indium and a target ring is present outside the indium: this is the signal electrode. A transparent, conductive film called NESA film is provided inside the face plate. The NESA film is a thin tin oxide film made by blasting tin oxide on the face plate at high temperature; it comes into contact with the indium and a photo-conductive film is coated on it. Antimony trisulfide ($Sb_2 S_3$) is used as the photo-conductive material; the thickness of the film is several microns and it has a dark resistance of $10 \times 10^{12} \Omega$/-cm in general. The electron gun is provided opposite the photoconductive film; it is composed of cathodes, G1, G2, G3, G4, G5 and G6. G1 is the electron beam control grid and G2 is the acceleration electrode; an approx. $35 \sim 60\ \mu$ extremely fine apertures is provided as G2 to control the thickness of the electron beam and improve resolution.

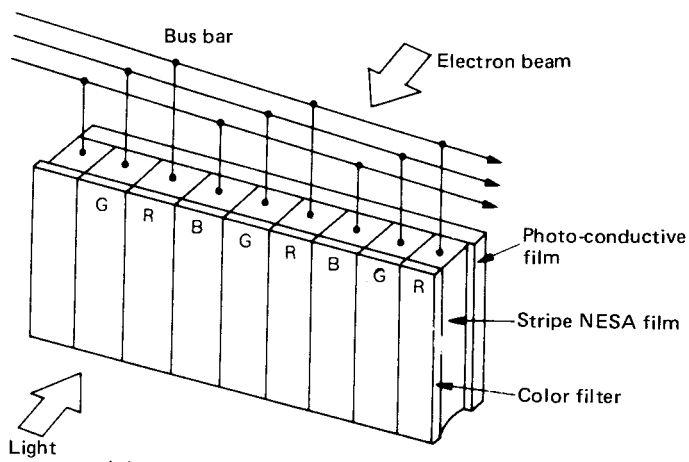
G4 is a focus electrode and composes the electron lens together with G3 and G5. Electron output from the beam aperture of G4 is concentrated by the focus electrode and scanned by the deflection magnetic field. An alignment magnet is provided on the exterior between G1 and G2 so that the electron beam passes through the center of the aperture and hits the photo-conductive surface perpendicularly.

G6 is a mesh electorode. When a voltage 1.5 $\sim$1.7 times that of G5 is applied to it, a mesh collimating lens system is provided between G5 and G6; it makes the path of the electron beam perpendicular to the photo-conductive surface improving uniformity of the signal output and pheripheral resolution.

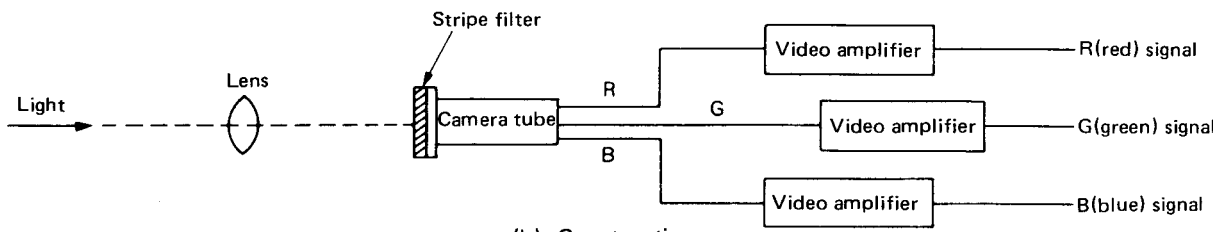
2—2 Tri-electrode system

This system is: R(red), G(green) and B(blue) stripe filters are provided on the focusing surface of the camera tube as shown in Fig. 2-2(a) and the 3 original color signals are taken out directly by connecting individual signal electrodes corresponding to each color. The color resolution of the optical system of a 3-tube system and 3 camera tubes are integrated in one camera tube.

With the frequency separation system and the phase separation system, the 3 superimposed original color signals are taken out from the camera tube and separated from each other, so it requires a complicated electric circuit and troubles accompanied by this are likely to occur. However, the 3-electrode system is based on the same principle as that of the 3-tube system as shown in Fig. 2-2(b), so color reproductivity equivalent to the 3-tube system can be obtained from a compact light-weight, easy-to-handle, highly stable and low cost camera.



(a) Mechanism of surface of camera tube



(b) Construction

Fig. 2-2 Principle of 3-electrode color video camera

2—3 Operation principle of VIDICON

The VIDICON outputs the video signal using the change in electric resistance when light is applied to the photo-conductive film - the target. The electron beam discharged from the electron gun is once accelerated to several hundred volts, deflected by the deflection section, and then reduced and scans the target surface. The photo-conductive film is assumed to be a series circuit with the static capacity C due to dielectric constant of the film itself and its thickness and resistance R. When the voltage is applied to the target via the load resistor R_L, the potential of the target plate of the photo-conductive film is set to the target voltage by the effect of NESA film. So, when the electron beam output from the electron gun scans the photo-conductive film, the potential at that section drops to the cathode potential, so a potential difference roughly equivalent to the target voltage occurs on both sides of the

photo-conductive film. This potential difference is discharged by the leak resistance of the photo-conductive film, and this leak resistance changes corresponding to the intensity of light.

2-3-1 Operation when incident light is not present

The photo-conductive film has no conductive characteristics (infinite resistance), the cathode side of the target is charged until it reaches approximately the same potential as the cathode and the potential difference of both sides of the film becomes roughly the same as the target voltage, so charge current does not flow and the signal current becomes zero.

2-3-2 Operation when incident light is present

When incident light is present, conductivity occurs, the charge is discharged according to the intensity of light and the charge on the target surface decreases. The electron beam is applied frame by frame, and this current is derived from R_L as the signal current. In this case, the target is sufficiently thin so the density of picture elements and the horizontal movement of the charge can be neglected.

2—4 Various characteristics of VIDICON

2-4-1 Dark current and target voltage

When the VIDICON is operated without applying light, target current flows to a certain extent. This current is called dark current and is one standard of operation. Fig. 2-3 shows the relation between the target voltage and the dark current when the face plate temperature and the scanning area of an ordinary VIDICON are set constant. It is found that sensitivity is increased by a power of approx. 1.5, and the dark current, by a power of 2.5 - 3, by raising the target voltage.

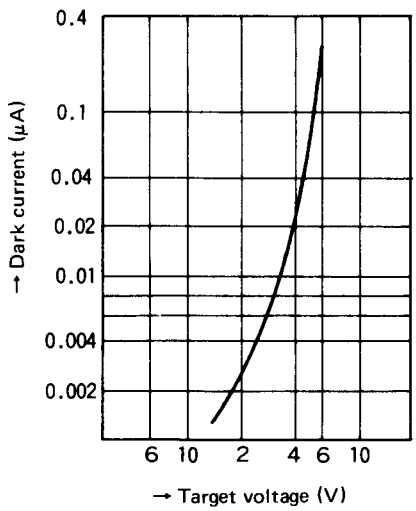


Fig. 2-3 Relation between target voltage and dark current

2-4-2 Photo-conductive sensitivity characteristics

Photo-conductive sensitivity is the signal current when uniform surface luminance of 10 Lux is applied to the face plate, assuming the dark current as 0.02 μA in general, and the signal current is the value the dark current subtracted from the target current. This gives the optimum current to operate the VIDICON in the best condition. In general, the target voltage is applied so that the dark current of 0.02μA flows at 50 - 100 Lux (at VIDICON surface). (Setting sensitivity).

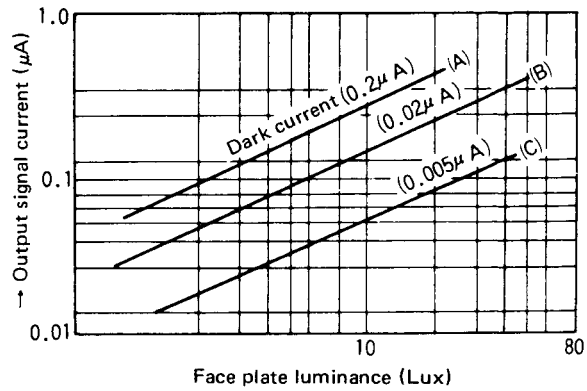


Fig. 2-4 Photo-conductive sensitivity characteristics

2-4-3 Beam amount

When more electron beam is applied than is required, it causes splitting of the beam, deterioration of resolution and uniformity of the output signal cannot be obtained resulting in shading, etc., so the optimum beam value should be set.

2-4-4 Burning and remaining image

The phenomenon that a STILL picture is shot for a long time, and then its light and shade is inverted and taken out as a signal, and does not disappear easily or does not disappear permanently is called burning.
Residual images for short times such as approx. 1/20 sec are a problem but the phenomenon when the signal is output for several seconds up to several ten of seconds is called remaining image.

2-4-5 Service life of VIDICON

The deterioration of the VIDICON is due decrease in its emission. When emission decreases reduced white (beam lacking) may occur, alignment may become difficult to obtain, and focus also deteriorates. The service life is considered in general to be approx. 3,000 - 6,000 hrs; it differs for the type of tube and conditions for use.

2-4-6 Handling VIDICON

The heart of the camera is the VIDICON. The VIDICON is not resistant to shock; defects (bright spots) occur when a shock of 2.5G or more is given. Finger marks, etc. on the lens must be avoided because they degrade picture quality. Use lens cleaning paper to wipe off dust, dirt, etc.

3. OPERATIONS OF PARTS

3–1 Video PC Board

The video PC Board is composed of the video circuit (process amplifier circuit, Y matrix/aperture circuit, color difference amplifier circuit, AFC/AGC circuit), auto-iris circuit, VTR trigger circuit, level indicator circuit, audio amplifier circuit, white balance indicator circuit, battery indicator circuit.

3-1-1 Video circuit

The video circuit amplifies R/G/B signals output from the camera tube to compose the Y signal and the color difference signals (R-Y, B-Y signals). The block diagram of the video system is shown in Fig. 3-1.

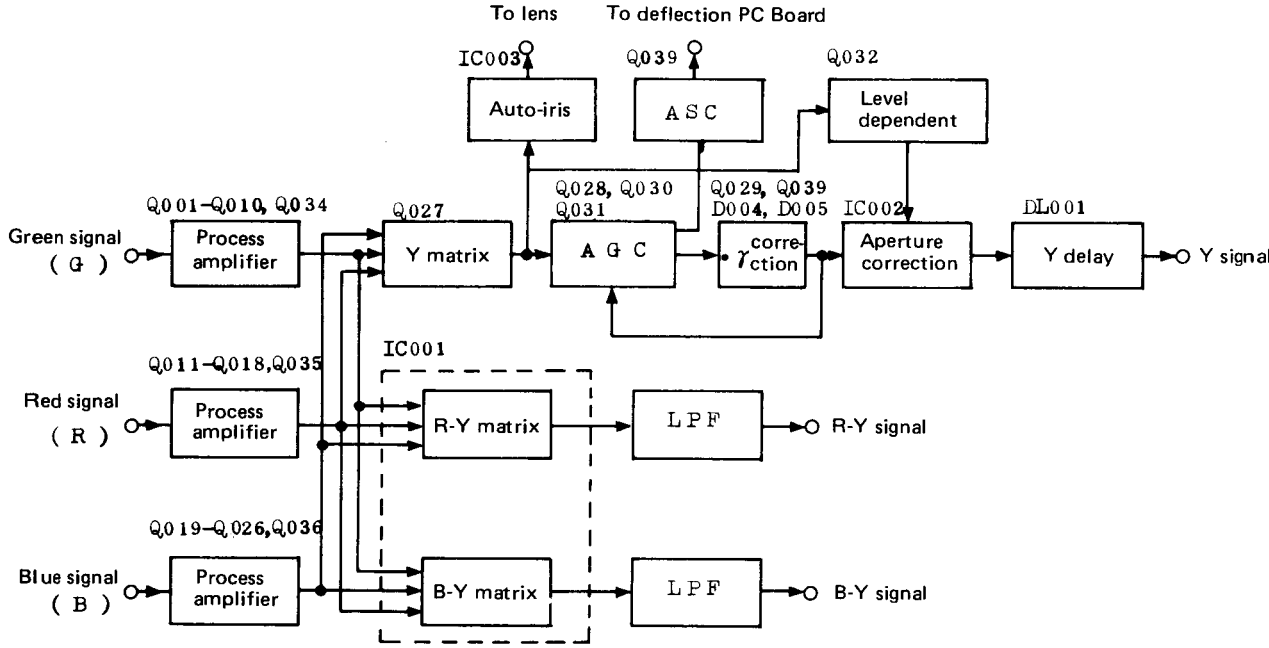


Fig. 3-1 Video system block diagram

(1) Pre-amplifier circuit

The pre-amp. amplifies the weak signal from the VIDICON, produces the video signal with required amplitude to facilitate later signal processing. The signal output from the VIDICON is constant power with no equivalent noise, and its value is very low, approx. 30 nA per electrode, so the noise of the camera as a whole is determined by this pre-amp.

An FET with an excellent noise index is used in the initial stage for this purpose, and gate resistance is set as 1MΩ. Approx. 3MHz bandwidth is required for the video signal, so sufficient NFB is applied and the dummy input impedance of the pre-amp. is reduced to approx. 500Ω.

The ratio of the green, red and blue video signals output from the VIDICON differs depending on the color temperature and unevenness of the VIDICON when the same white is shot. So, the resistance of the NFB loop of the pre-amp. is varied so that the ratio of the pre-amp. output when white is shot is 1:1:1. The 0.05Vp-p video signal is obtained at the pre-amp. output.

Fig. 3-2 shows the pre-amp. circuit. The basis is the grounded emitter direct connection 2-stage amplifier consisting of Q1 and Q3. RV301 is the input adjusting semi-variable resistor to control so that color does not smear.

(2) Process circuit

The process circuit is composed of the circuits shown in Fig. 3-3 including the clamp circuit, linear clip circuit, etc.

Q001 is the clamper block, Q002, Q003 and Q034 compose the block of the +6 dB amp. and emitter follower, and Q004 is the block which gates the optical black. Q005 and Q006 compose the block of the feedback clamp amp, and VR001 is the VR which adjusts the black level of the signal. Black balance is adjusted by tuning tracking among 3 channels - R, G, B. This VR inserted in the G Ch adjusts set-up of the total circuit, and VRs (RV002, RV003) in R Ch and B Ch equivalent to the above adjust the black balance.

Q007 and Q008 compose the block of the white blanking amp. and white clip circuit, Q009 and Q010 compose the block which performs black clipping. Shaping of the blanking section is done by the combination of Q007 and Q010.

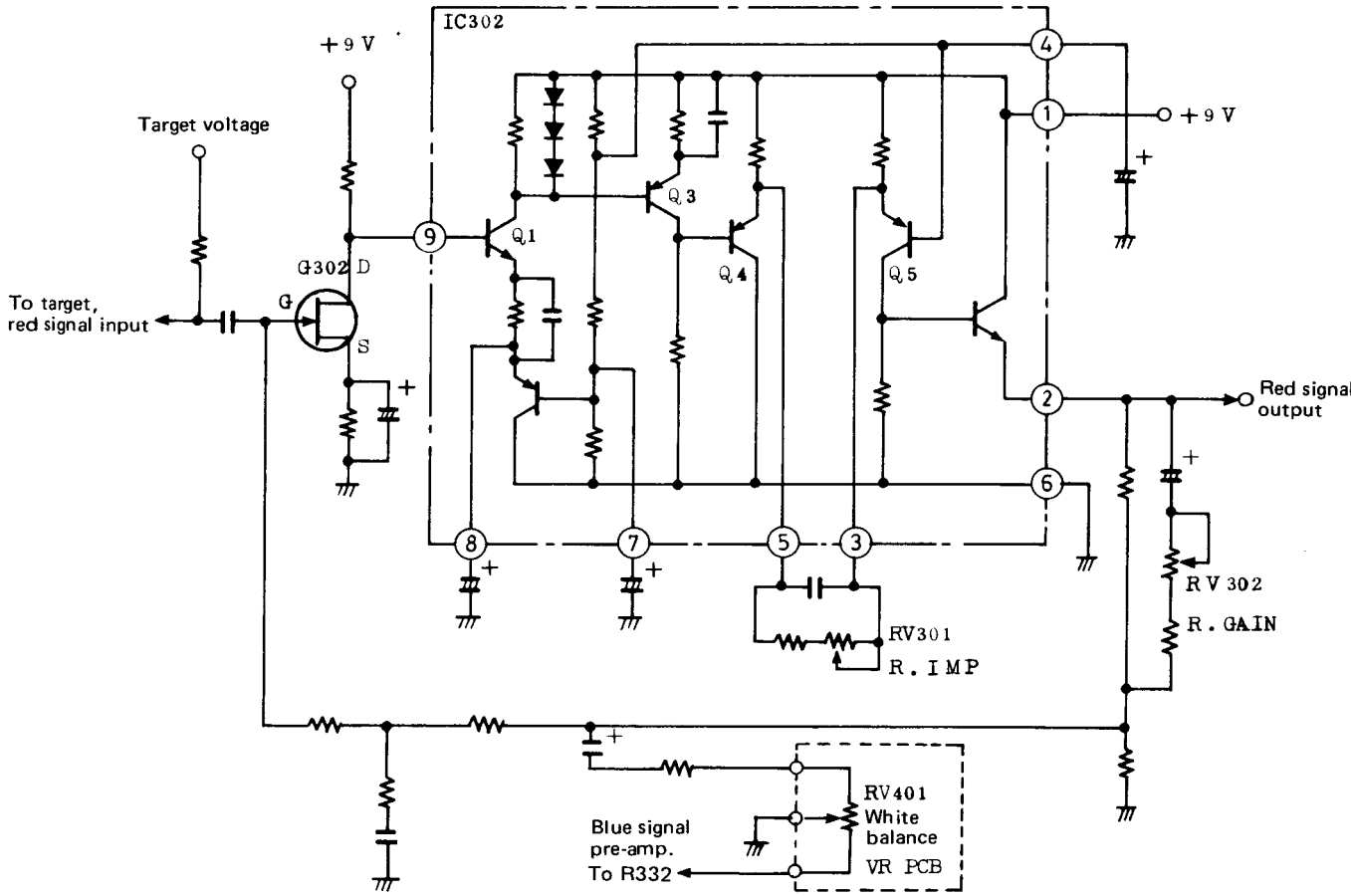


Fig. 3-2 Pre-amp. circuit (red signal circuit)

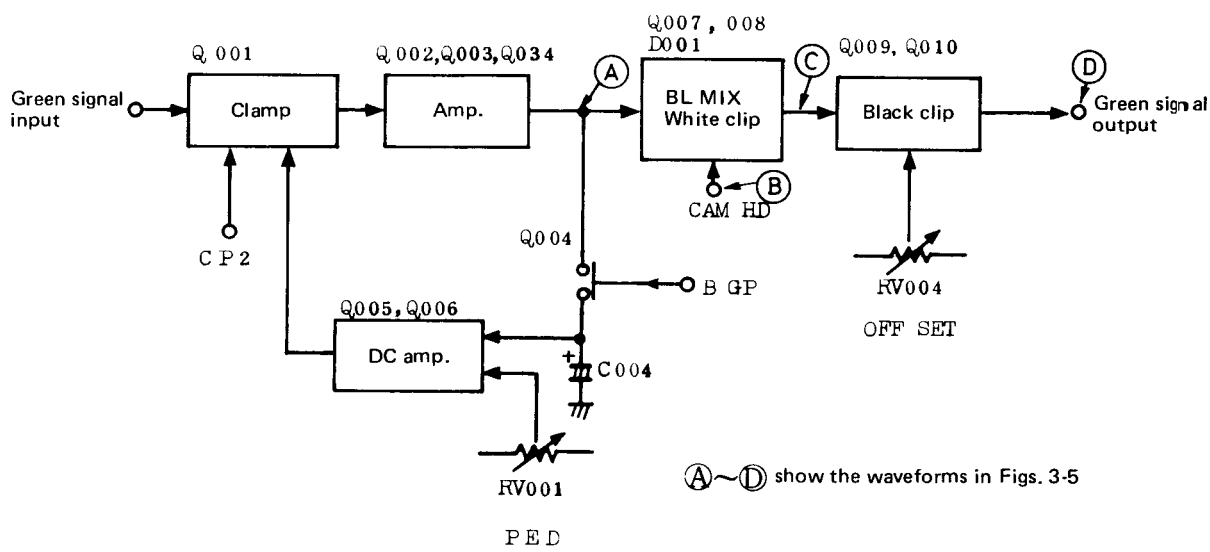


Fig. 3-3 Process circuit block

(2)-1 Clamp circuit

It is required to fix black level direct current which is a standard of the signal when correcting gamma or signal processing linear clip. To fix black level direct current, the black level of the 6 dB amp. is sample held by the gate pulse, and this voltage and the clamp control voltage (Q006 base) are compared amplifiers. The output signal from the pre-amp. is clamped by this amplified output voltage.

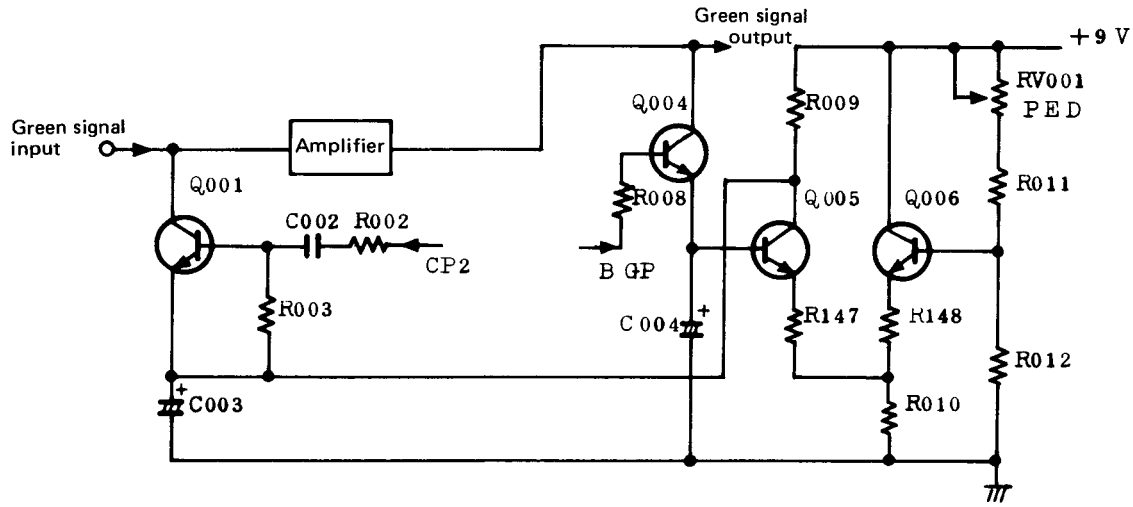


Fig. 3-4 Clamp circuit (Green signal circuit)

(2)-2 Linear clip circuit

A high level of synchronizing noise is superimposed over the blanking period of the video signal obtained from the pre-amp. which is to interrupt the deflection pulse, etc. As the video signal becomes larger, it may exceed the rated level. The linear clip circuit clears the blanking period and clips the video signal to the specified level.

Fig. 3-5 shows its operation. When the blanking signal is applied to Q009, the blanking signal is mixed to the input video signal and white clip is done by the base bias of Q008. Black level is determined by the DC potential of Q010.

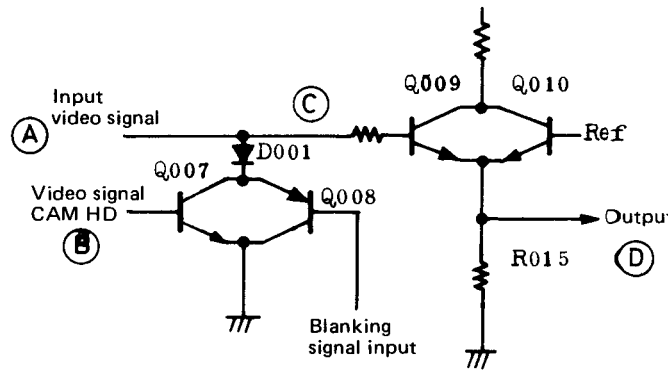


Fig. 3-6 Linear clip circuit

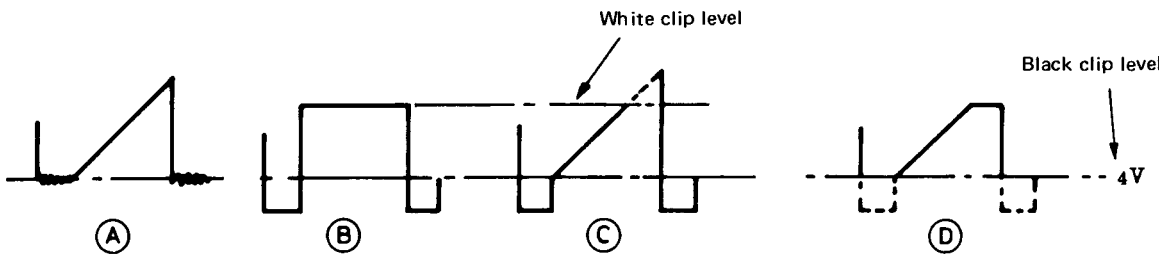


Fig. 3-5 Linear clip operation

(3) Y matrix, AGC, γ circuits

The R/G/B output signals supplied from the process circuit are added through the matrix resistors R045, R046, R047 to form the luminance signal, and then the signal amplified by the AGC amps Q030, Q031 is supplied to the gate of Q028 to control gain by approx. 6 dB. The gain of Q029 is determined by the ratio of resistances R052 and R050 + R051. The resistance of Q028 inserted in parallel with R051 is controlled by the gate voltage to qutomatically change gain of Q029, to apply gamma by D004, D005.

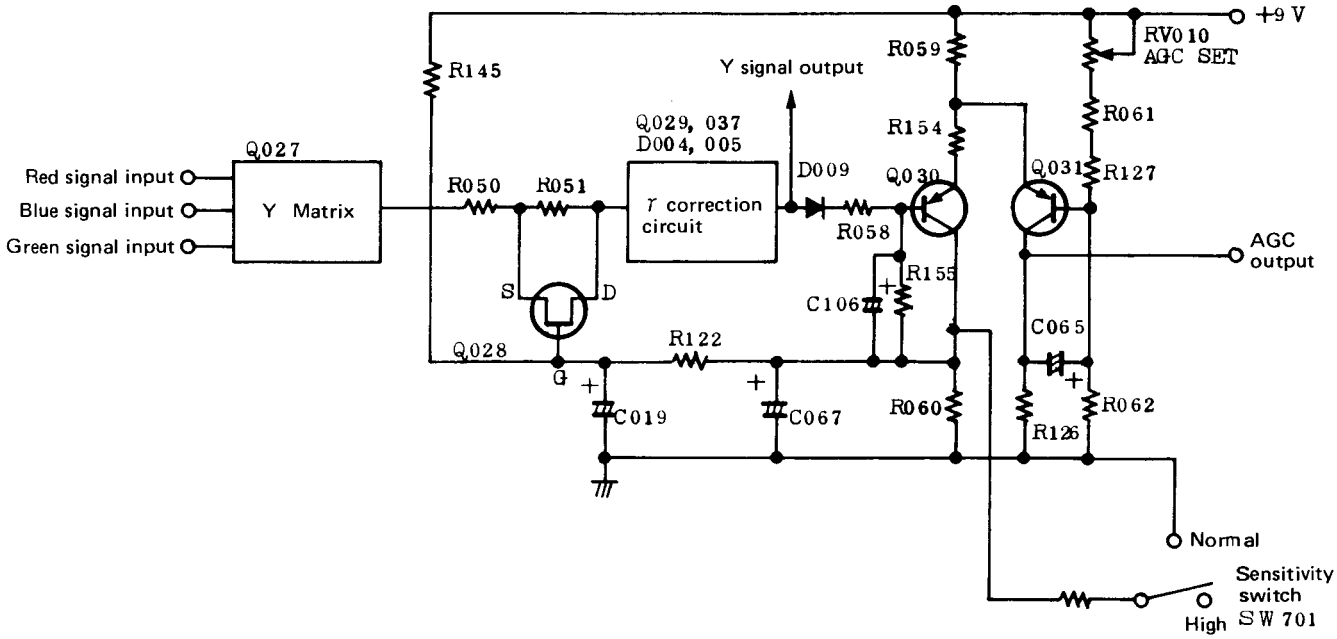


Fig. 3-7 Y matrix, AGC, γ circuits

The γ correction circuit is shown below. This correction value is designed to be r = 0.7.

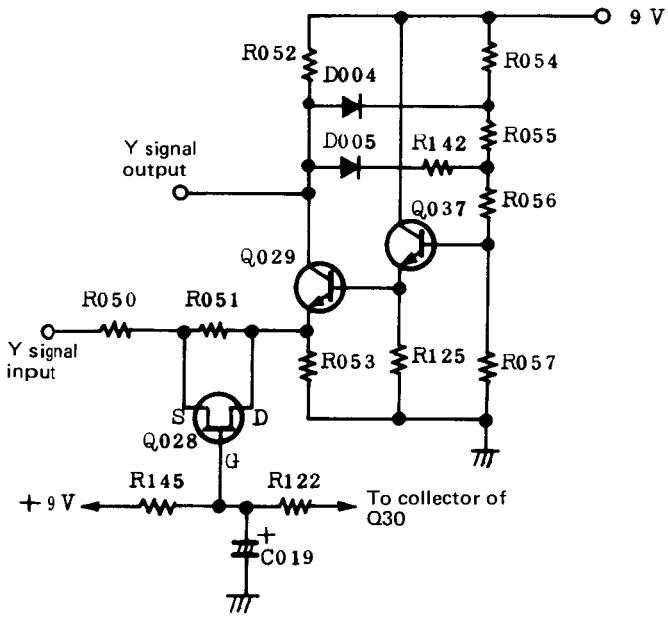


Fig. 3-8 γ circuit

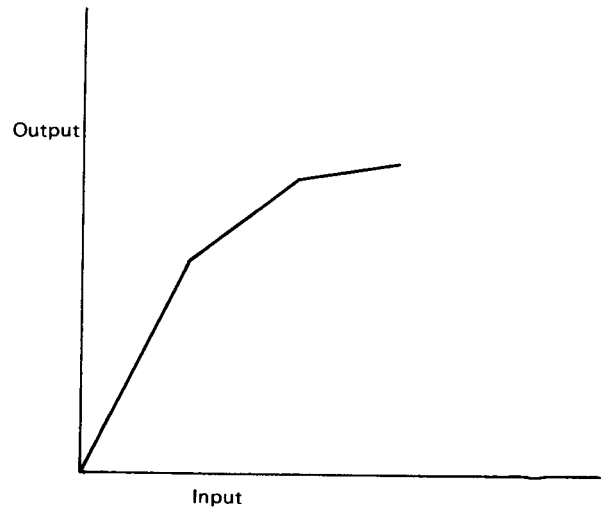


Fig. 3-9 γ correction curve

(4) ASC circuit

Q039 is driven by the signal of one output terminal (Q031: Collector) of the AGC differential amp. to control the target voltage.

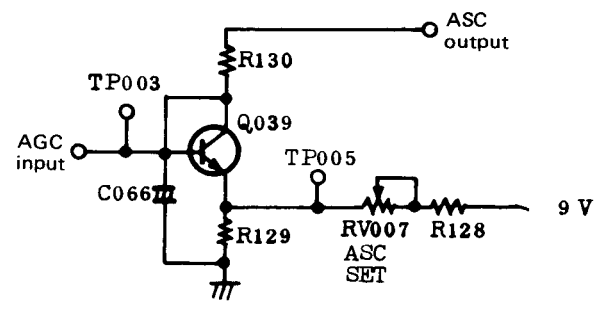


Fig. 3-10 ASC circuit

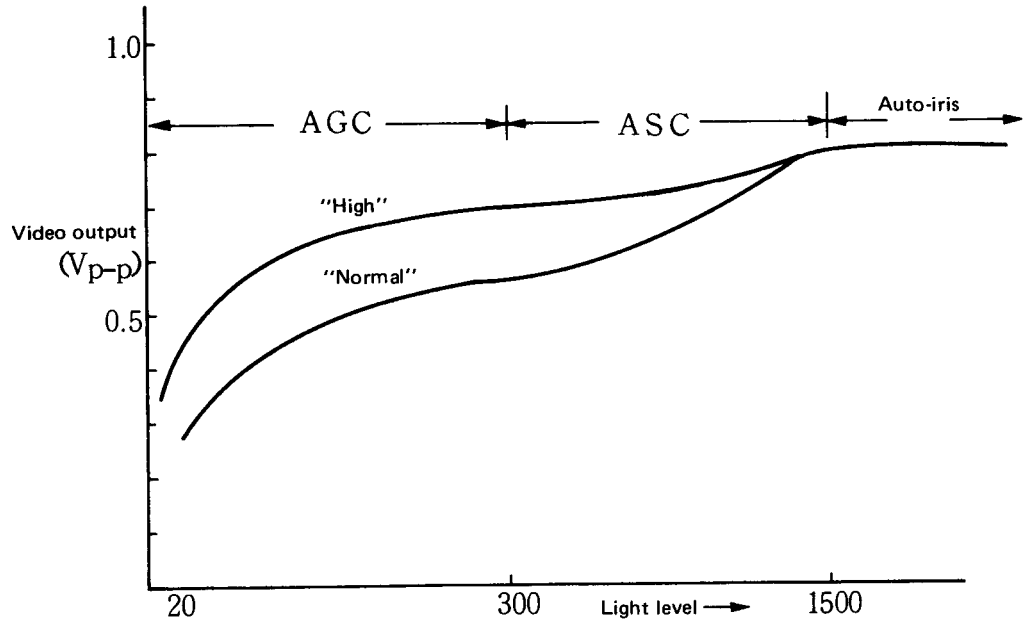


Fig. 3-11 AGC/ASC characteristics

(5) Multiplex/LPF circuit

This circuit produces the color difference signal from the R/B/G signals. It is composed of the R-Y circuit and B-Y circuit; they are equivalent to IC001. The circuit diagram is shown below.

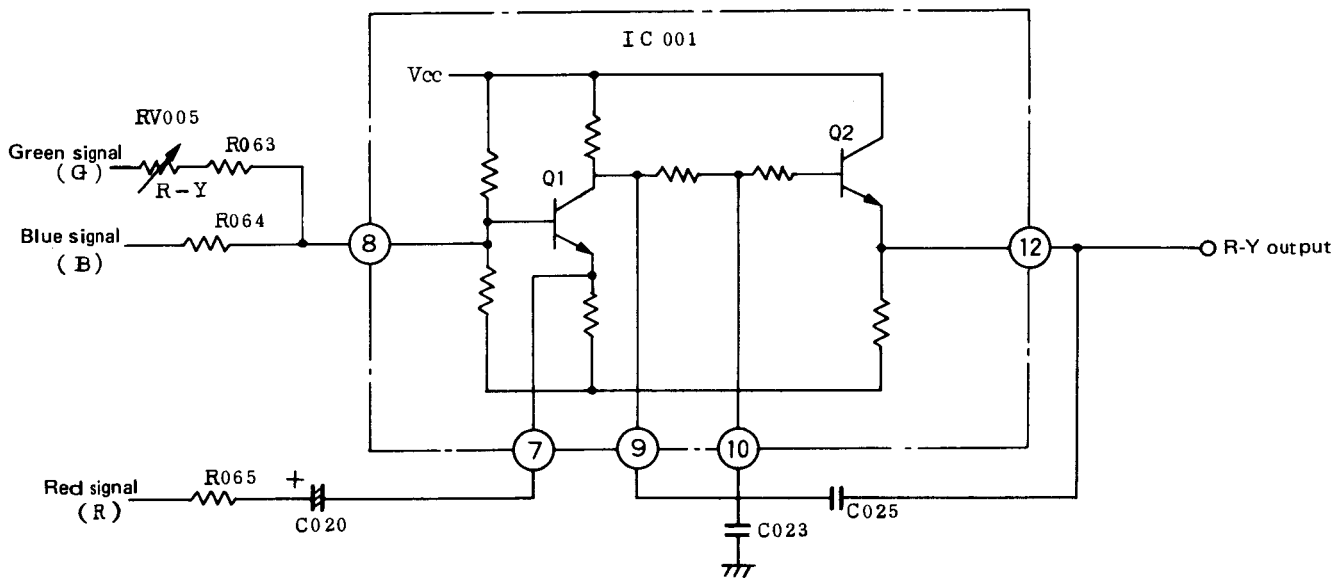


Fig. 3-12 Matrix/LPF circuit

Q1 acts as emitter GND with respect to the G signal input via RV005 and RV063 and the B signal input via R064, so these signals appear at the collector of Q1 with their phases inverted. On the other hand, it acts as the base GND to the R signal input to the Q1 emitter GND via R065, which appears at the collector with the same phase as the input. When a white object is shot, the R, G and B signals are the same, so the output signals do not appear to the collector of Q1 as they cancel each other. RV005 is the VR for balance.

After this, the Q1 output signal is band-controlled via the LPF and becomes the R-Y output signal.

(6) Aperture correction, delay line, level dependent circuits

Aperture correction is applied by IC002 to the luminance signal processed by the Y matrix circuit. The level of the input to this IC002 is approx. 1.0Vp-p. Q1 and Q2 inside IC002 correct the deterioration of the high frequency of the luminance signal caused by the horizontal aperture distortion, by means of the coil DL002 externally attached to

pins 2 and 5. Timing adjustment is performed by the phase matching delay coil (DL001) inserted between Q3 and Q4, to match the phases of the luminance signal and the chroma signal. The circuit is shown in Fig. 3-13.

Q032 is the level dependent transistor. Its characteristic is such that aperture correction for approximately 6th stage of the chart is changed when the grey scale chart is shot.

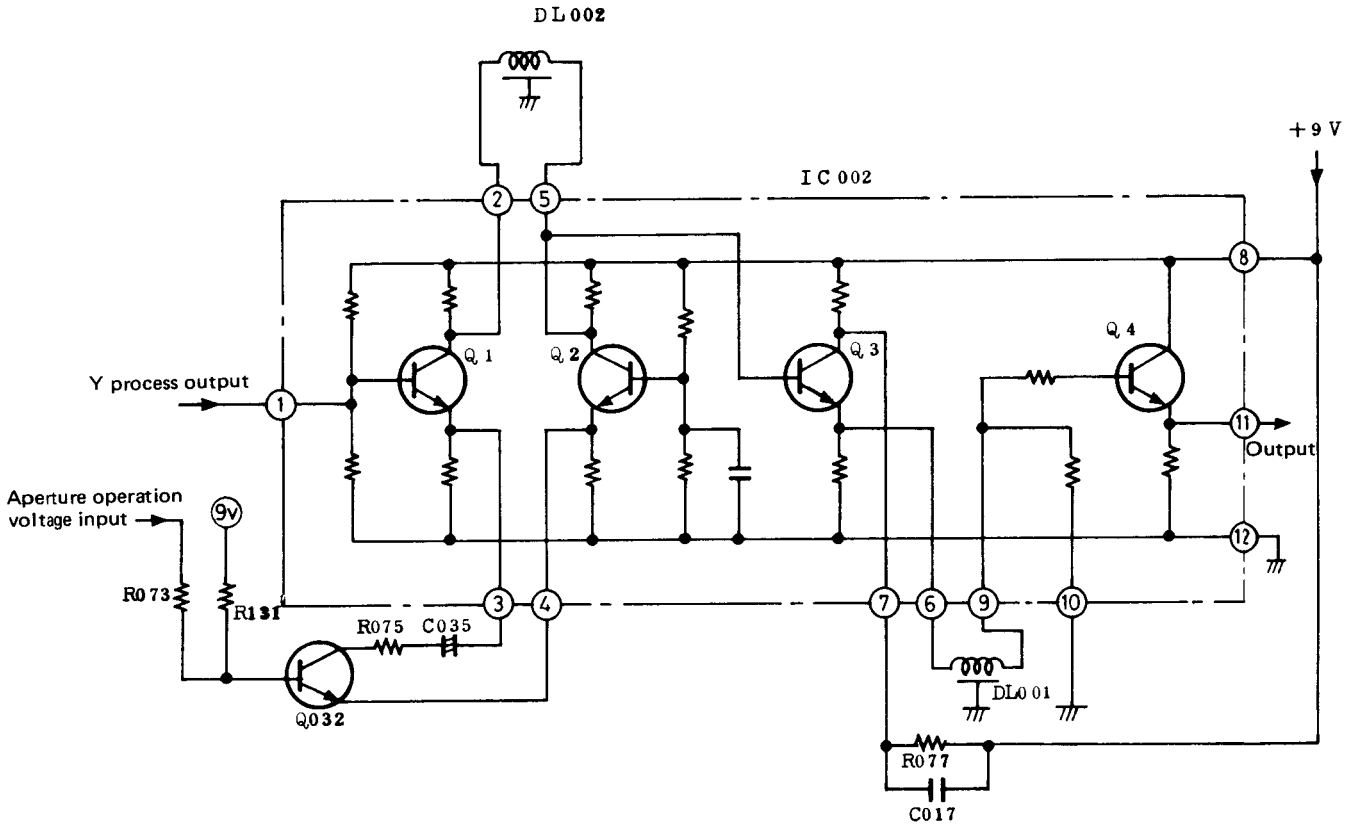


Fig. 3-13 Aperture correction, delay line, level dependent circuit

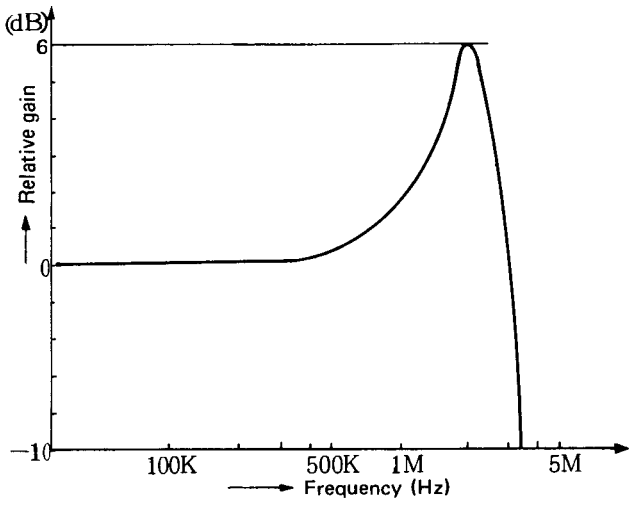


Fig. 3-14 Aperture frequency responce

3-1-2 VTR trigger circuit

This circuit operation is done by IC005, Fig. 3-15 shows the IC and peripheral circuits.

The reset mode of the flip-flop Q4 and Q5 is: Q4, ON and Q5, OFF. When the power is applied, the flip-flop always enters the reset mode, and is inverted every time the remote control switch (non-lock type) is pressed. The VTR enters the STOP mode when the flip-flop is in the reset mode, and enters the operation mode when the flip-flop is in the set mode. The VTR repeats the record and stop modes every time the remote control switch is pressed.

The "V" LED inside the viewfinder lights and the operation can be checked when the VTR is operating.

The polarity of the VTR trigger output differs depending on the type of VTR used; matching is possible by switching polarity using SW001. It is set to "H" usually.

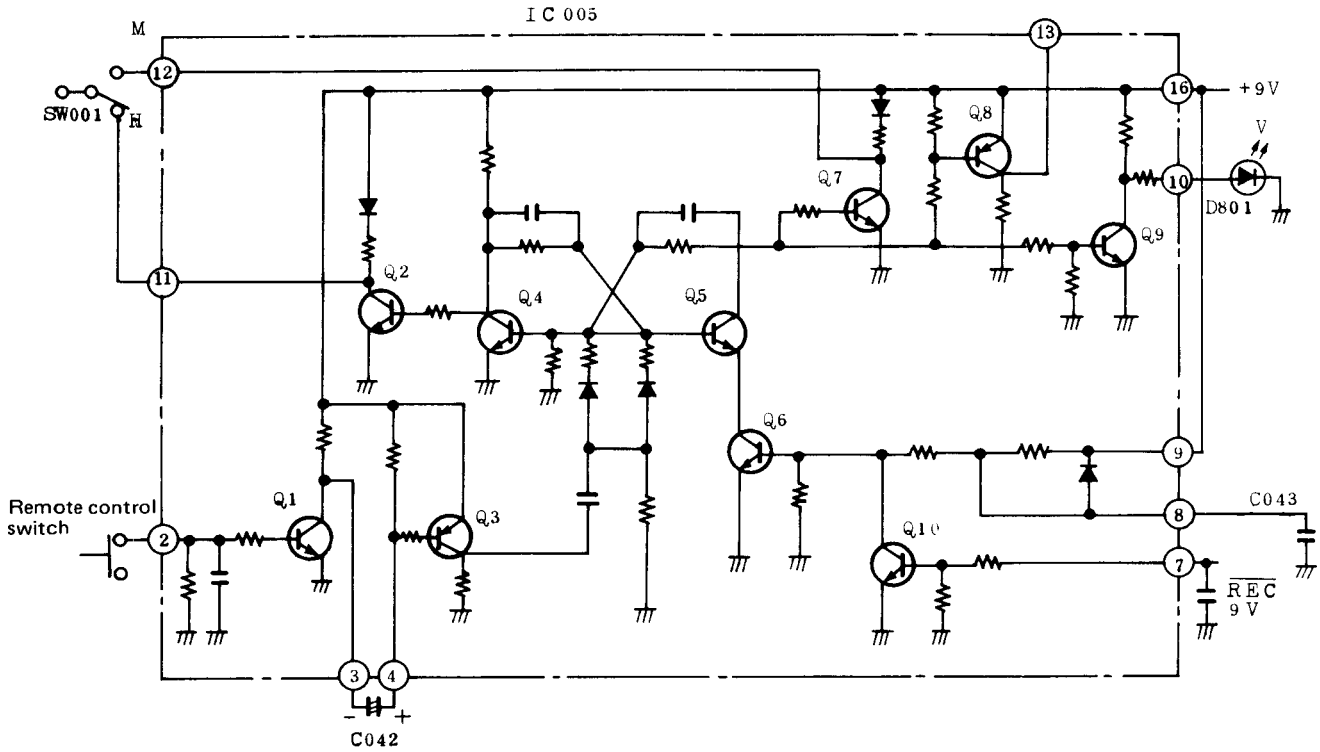


Fig. 3-15 VTR trigger circuit

3-1-3 Battery indicator circuit

This circuit lights the alarm lamp and indicates that the battery capacity of the VTR is low.
When the VTR battery is low the detector circuit of the VTR operates and the DC component is superimposed over the return audio signal.
(The DC component is 0 during normal operation.)
This DC component is applied to IC004 via R079 to set pin 14 to "LOW" level, so the "B" LED in the viewfinder lights.

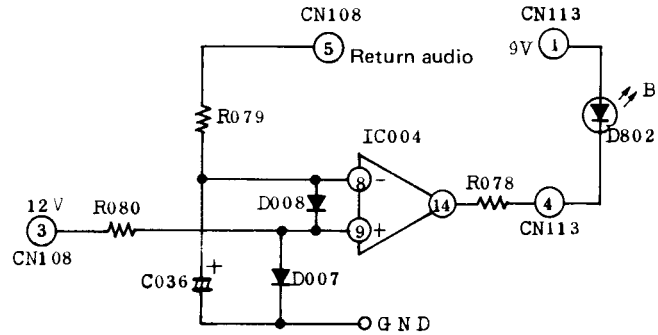


Fig. 3-16 Battery indicator circuit

3-1-4 Level indicator circuit

This circuit supplies the rectified luminance signal to IC004 pin 11. RV009 is adjusted so that the circuit is inverted (LED lights) when the grey scale chart is shot and the output drops to 70% (appr. 0.56Vp-p) of the rated output; the voltage becomes the input of comparator IC004 pin 10.

When the video output drops to approx. 0.56Vp-p or less, the input voltage of pin 11 becomes lower than the input voltage of pin 10, so the output of pin 13 is set to "LOW" level and the "L" LED lights.

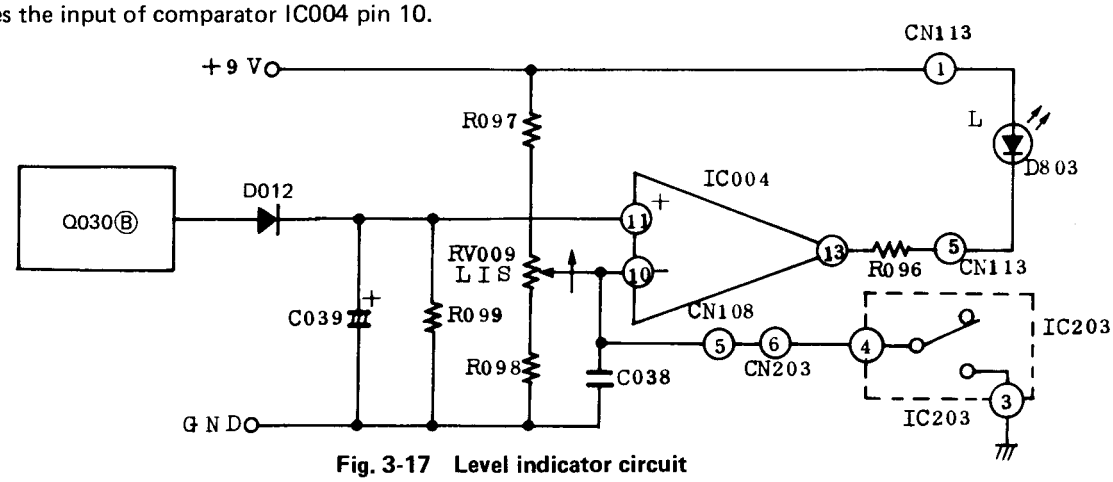


Fig. 3-17 Level indicator circuit

3-1-5 White balance indicator circuit

This circuit supplies the process output signal of Bch and Rch to IC004 pins 4 and 5 respectively. That is, when the Bch level is larger than the Rch level, pin 2 is set to LOW level, pin 1, HIGH level, and the indicator lights green. When the Rch level is higher than the Bch level, pin 2 is set to High level and pin 1 to LOW level, and the red indicator lights.

RV008 is the VR to adjust so that both red and green lightings go off when the carrier balance is best.

9V(A) is supplied to the emitter of Q033 via R084 when the power-save facility is used, and the base of Q033 is connected to 9V via R088; in this case, 9V is set to 0V, the GND voltage is supplied. At the same time, the power supply of IC004 is 0V, and pins 1 and 2 are set equivalent to the high level, so both the white balance indicator lights (red and green) and emit a yellowish orange color.

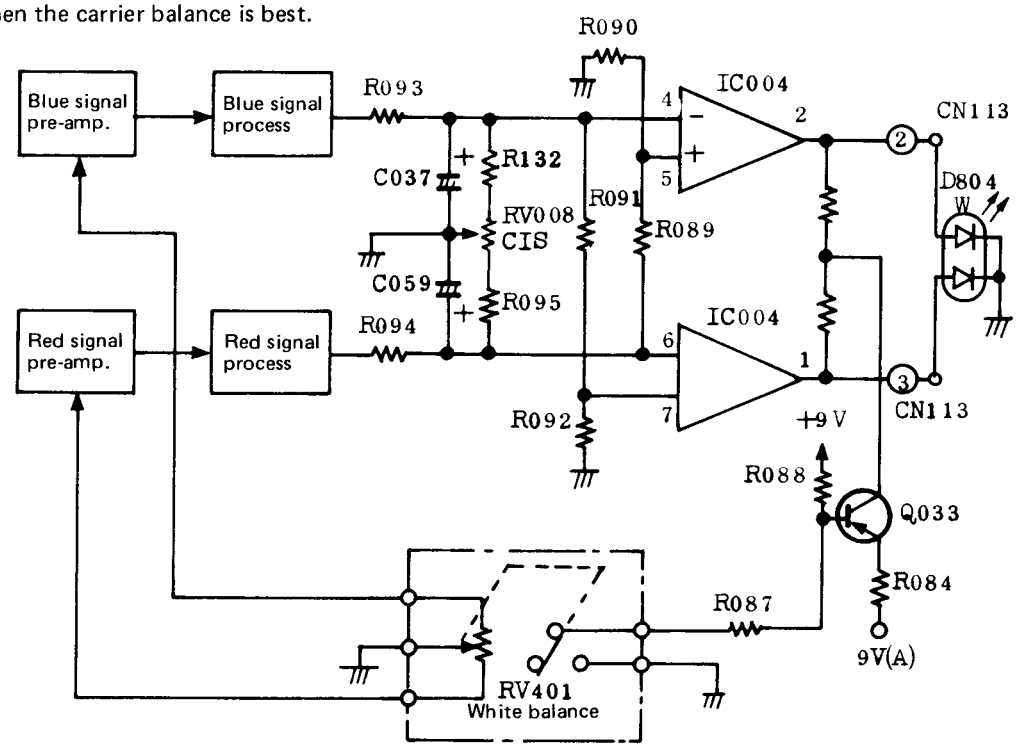


Fig. 3-18 White balance indicator circuit

3-1-6 Audio amp. circuit

The audio amp. circuit amplifies the audio signal sent from the microphone and supplies it to the VTR; it consists of IC007.

The gain of the whole amp. is 45 dB and a −20 dB output can be taken out when a −65 dB microphone is connected.

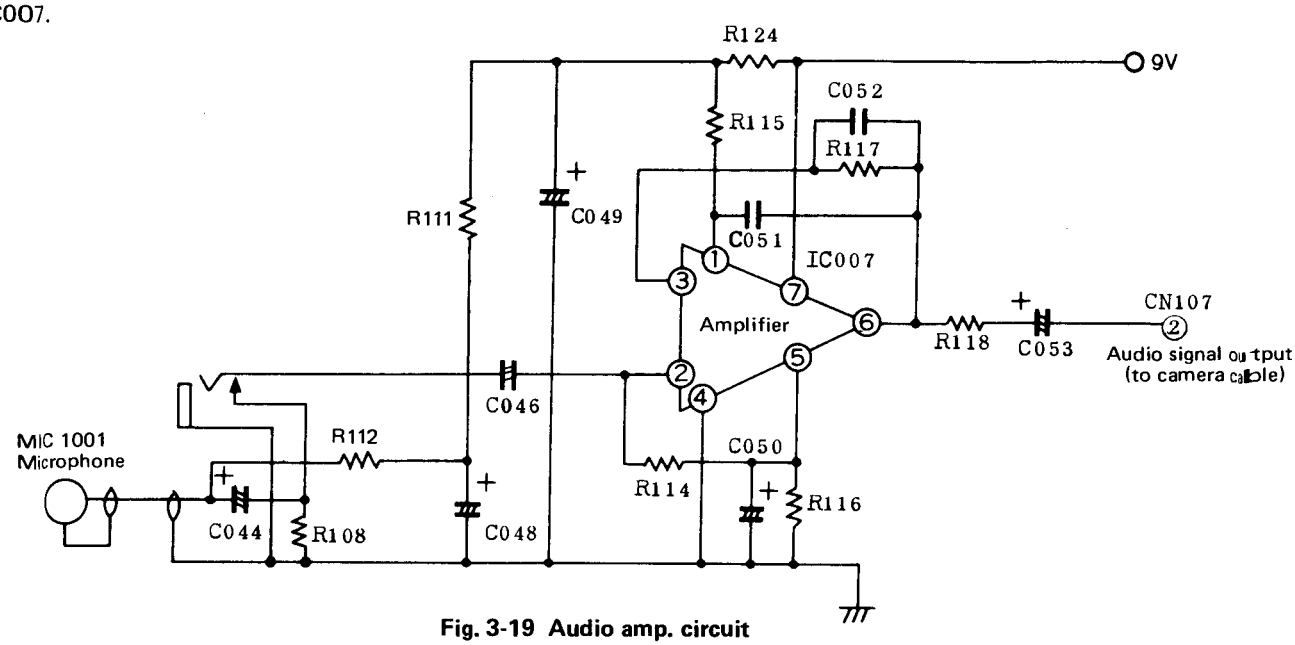


Fig. 3-19 Audio amp. circuit

3–2 Sync unit (ZC-0247AN)
(ZC-0247AP for VK-C600E)

The sync unit is composed of the SYNC generation circuit and the color modulation circuit, and it consists of a hybrid IC. Its interior is composed of the SYNC section HD440072 and the color modulation/video output section HA11720.

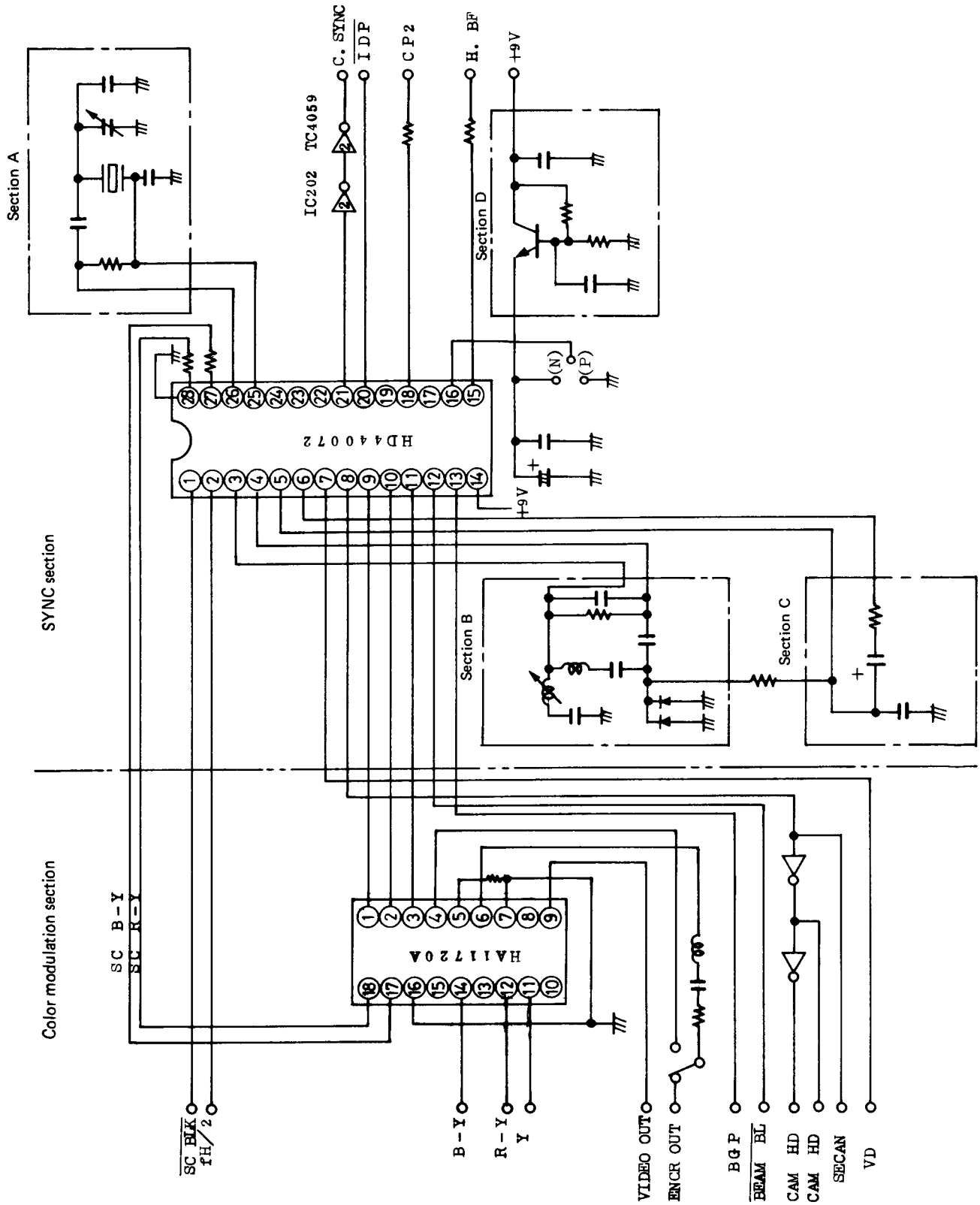


Fig. 3-20 Circuit diagram

3-2-1 SYNC circuit

The SYNC circuit of VK-C600 is composed of C MOS IC HD44072. This IC is the dual-in-line 28-pin plastic mold type IC which operates with a power supply of +7V. The SYNC circuit is described concentrating on the operation of HD440072 in the following.

Fig. 3-20 and Fig. 3-21 show the circuit diagram and the block diagram of HD440072.

Section A is a crystal oscillator which uses a C MOS inverter, and oscillates with the frequency of 14.31818 MHz (17.734475 MHz for VK-C600E), 4 times the sub-carrier. This oscillation frequency is divided by 4 and becomes the sub. carrier. The output signal is further divided by 162 and the output signal produced by dividing the VCO output of section B by 184 (161 for VK-C600E), and the phases of these signals are compared.

The output of this comparator is converted into direct current through the low-pass filter in section C to control VCO in section B. This is the PLL circuit. The VCO oscillation frequency of section B becomes 260 (282 for VK-C600E) times the horizontal frequency in this PLL operation. This is further divided by 2 and applied to the pulse forming circuit as the clock pulse, to obtain required pulses such as HD, VD and SYNC pulses. Section D in the diagram is the power circuit of HD440072; Q1 is the series regulator converting the input from +9V to +7V. IC232 is the C MOS inverter which operates as pulse polarity inverter or buffer.

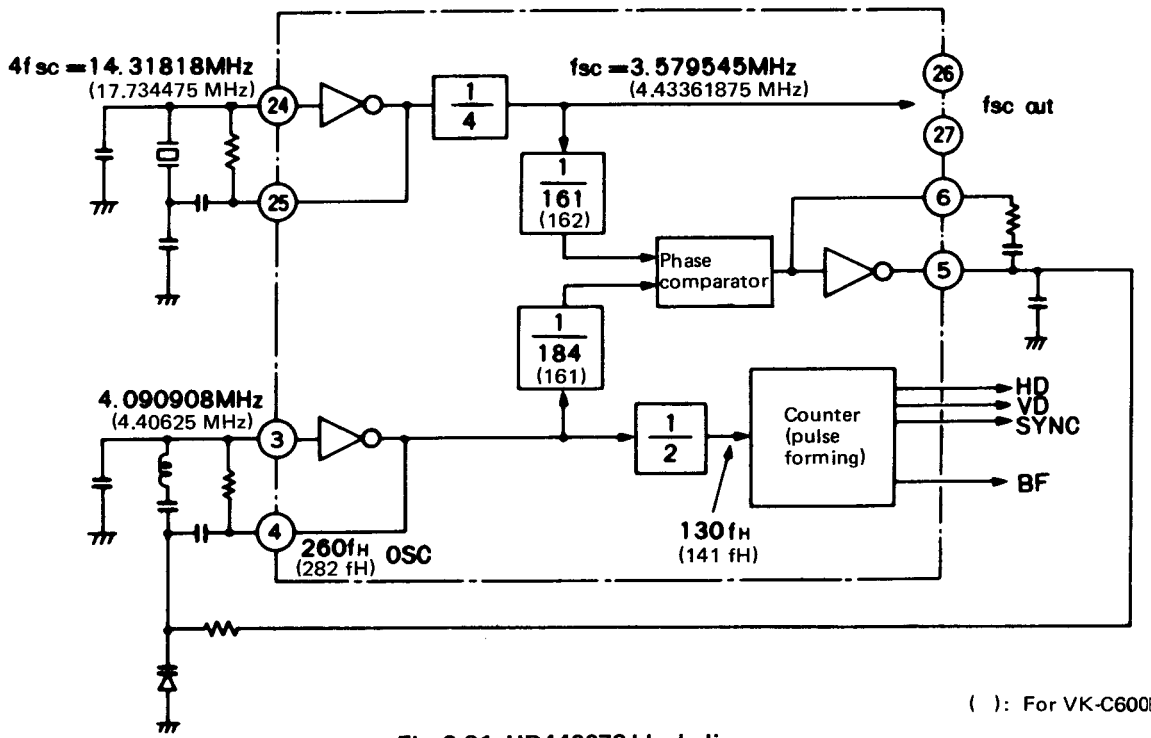


Fig. 3-21 HD440072 block diagram

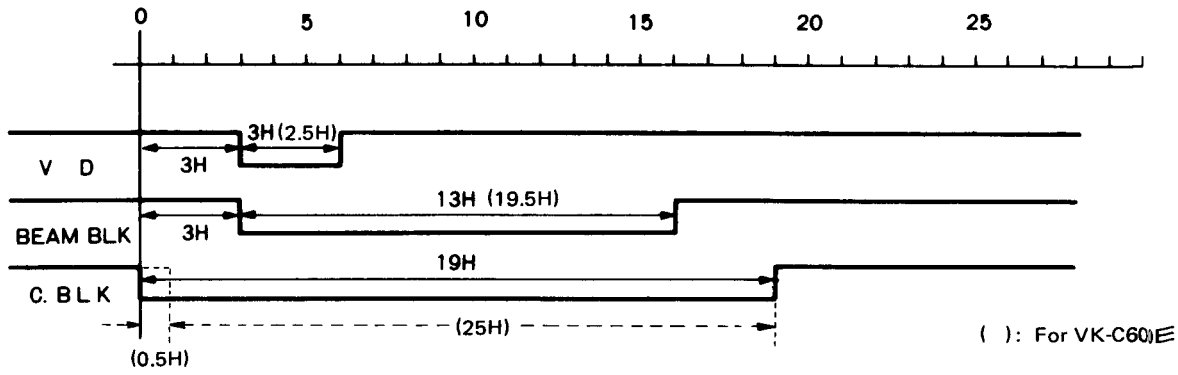


Fig. 3-22 Operation timing chart (V)

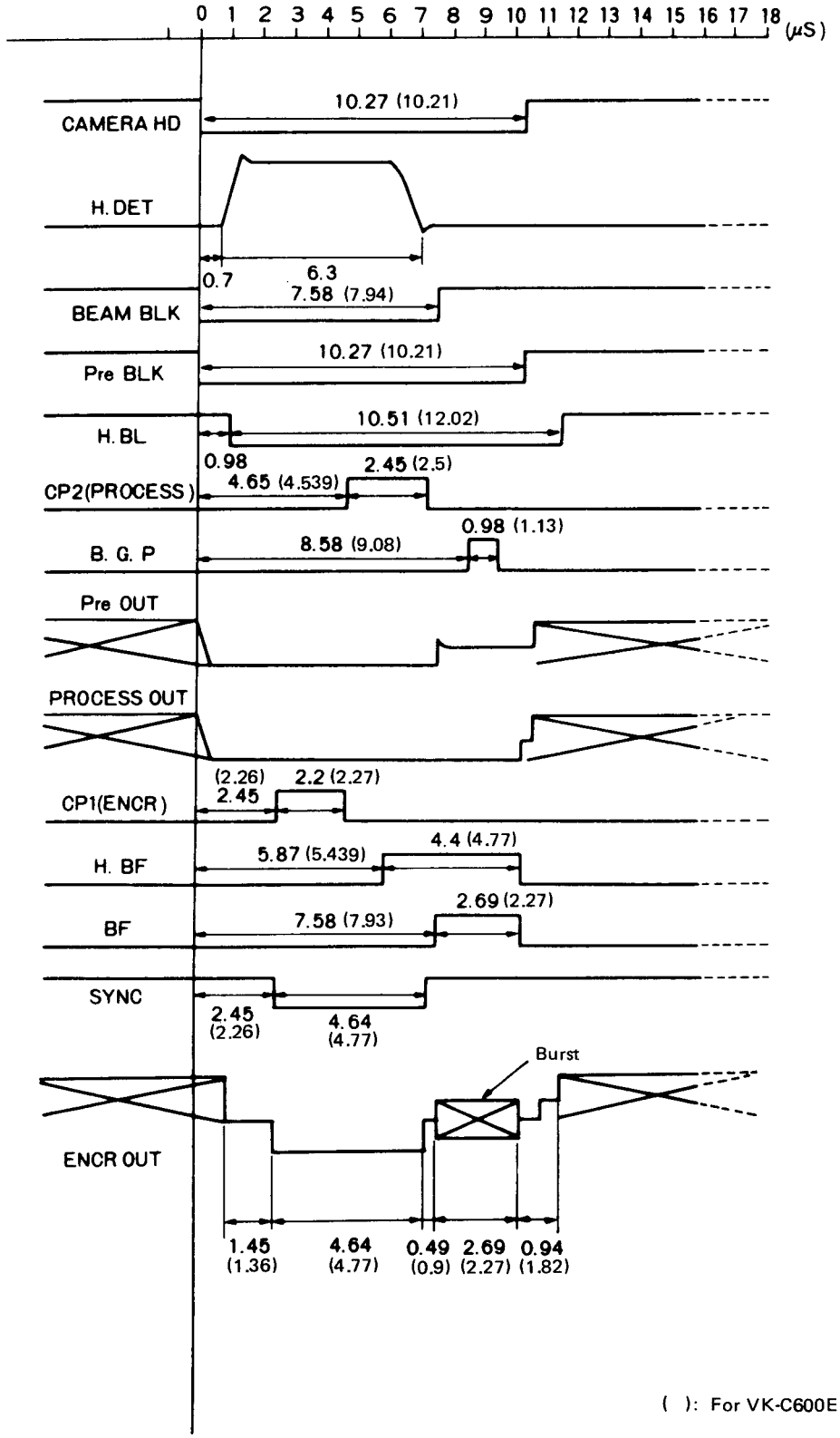


Fig. 3-23 Operation timing chart (H)

3-2-2 Color modulation/Video output circuit

This circuit converts the Y signal and the color difference signal (R-Y, B-Y signals) supplied from the video PC Board to the final NTSC signal. Fig. 3-24 shows the block diagram.

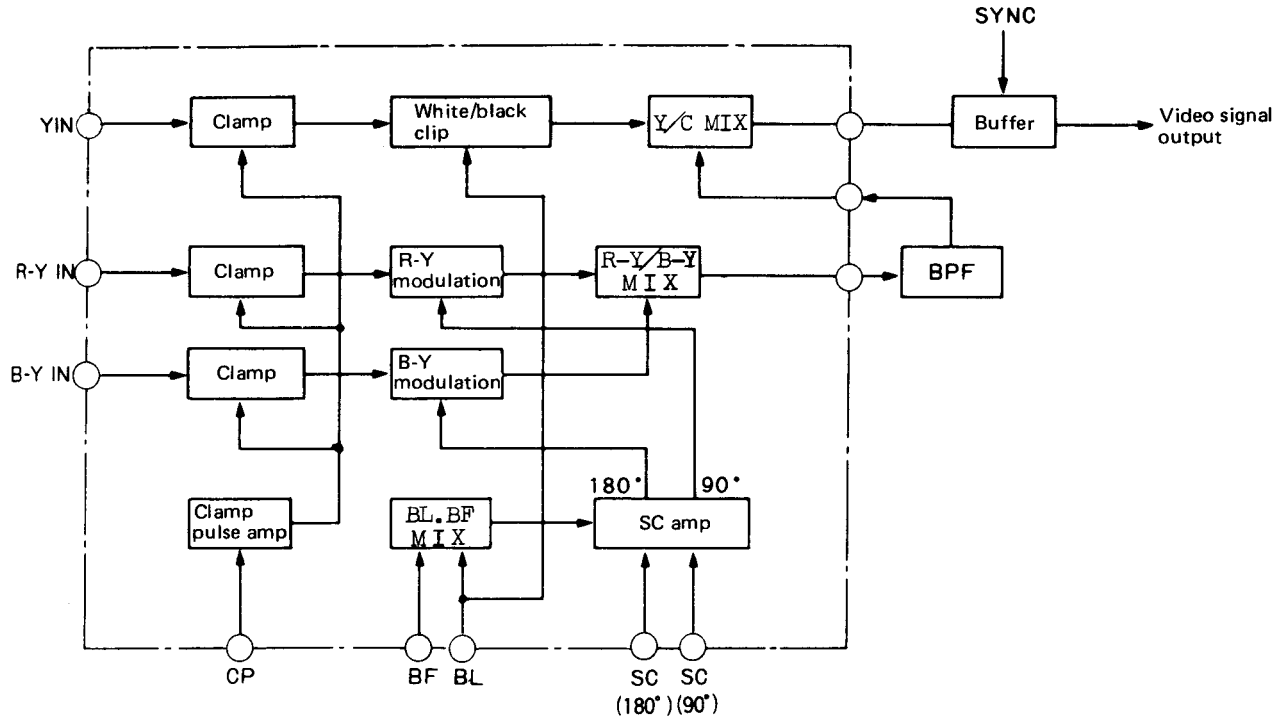


Fig. 3-24 Color modulation/video output circuit block diagram

(1) Video output circuit

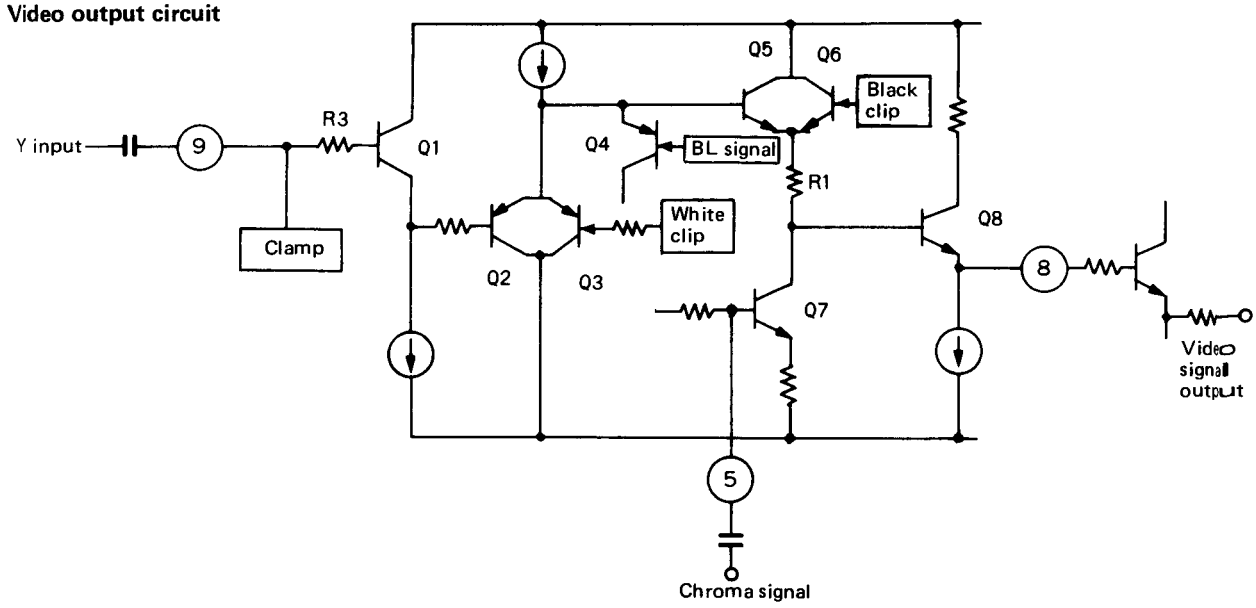


Fig. 3-25 Video output circuit schematic diagram

The Y signal is clamped at the input at first to fix the DC level. Next, it is white-clipped and blanking-mixed through Q2, Q3 and Q4. It is output via R1 and Q8 after black-clipping through Q5 and Q6. At the same time, the chroma signal is amplified by Q7 and mixed with the Y signal.

(2) BL, BF mix circuit

The BL (Blanking) pulse fixes the base of Q1 to a certain DC potential, so it is level-controlled by Q1 and Q2.
The BF signal is level-controlled by Q7 and Q8 in the same way. These 2 signals are mixed in Q3 and Q4.
This signal is DC-shifted by Q6, applied to the SC amplifier circuit described later and it gates the sub carrier signal.

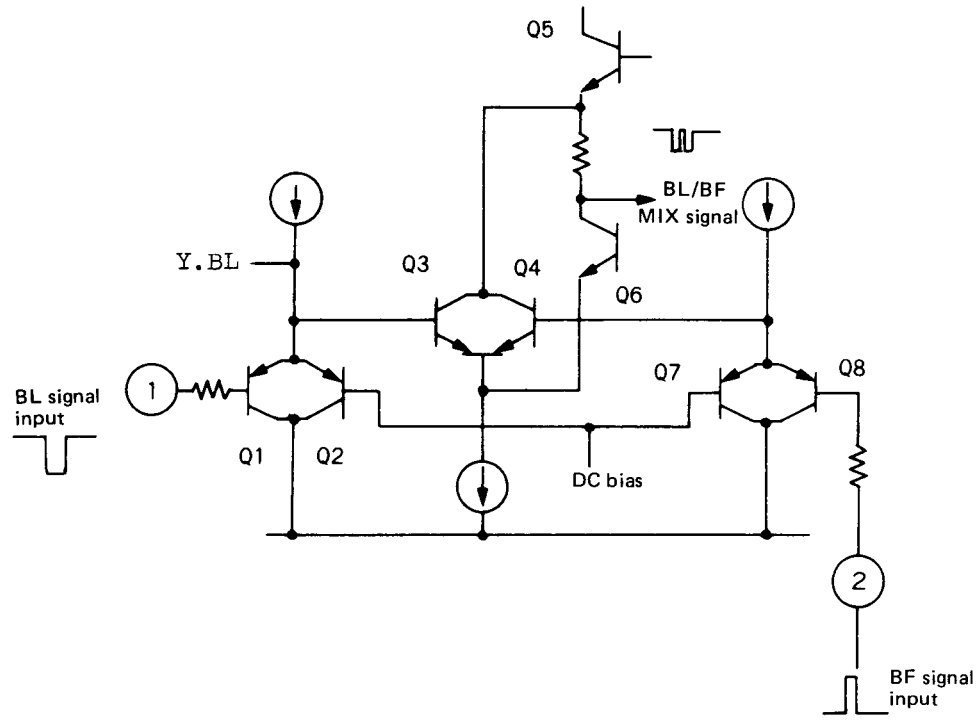


Fig. 3-26 BL/BF mix circuit

(3) SC amplifier circuit

When the sub-carrier is applied to the base of Q3 which composes the differential amplifier together with Q4, the sub-carrier signals with mutually inverse polarities are obtained at the collectors of Q3 and Q4. The DC offset of the output is regulated by Q2.

Q5 and Q6 operated and Q3 and Q4 are shut off to stop the sub-carrier output during the blanking period excluding the burst flag period.

This sub-carrier amp. is divided into 2, one for B-Y axis, and other for R-Y axis.

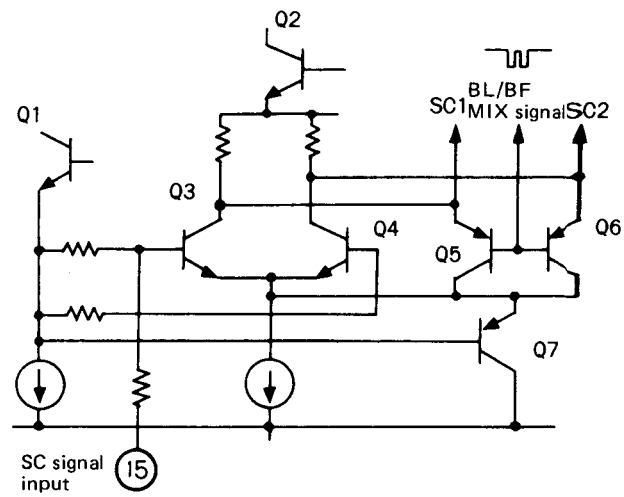


Fig. 3-27 SC amplifier circuit

(4) Modulation circuit

Fig. 3-29 is a diagram explaining the modulation section, and shows the waveforms at sections (A) - (G).

When the video signal (A) is applied to the base of Q1, and the sub-carrier (B), to the base of Q2, the signal shown in (C) is obtained at the common emitter.

When the reference DC voltage is applied to the base of Q6 and the sub-carrier, to the base of Q5, the carrier with its phase changed by 180° from (C) is obtained at the common emitter. When these signals are added through Q3 and Q4, the signal shown in (E) is obtained. In the same way, the modulation waveforms of the modulated signal with the same phase as (E) and the carrier with inverse phase as shown in (F) are obtained at the common emitter of Q9 and Q10. These signals are amplified by the differential amp. composed of Q15 and Q16, the same phase component is suppressed and the balanced modulation signal shown in (G) is obtained. The operation shown above is performed for the B-Y axis and the R-Y axis.

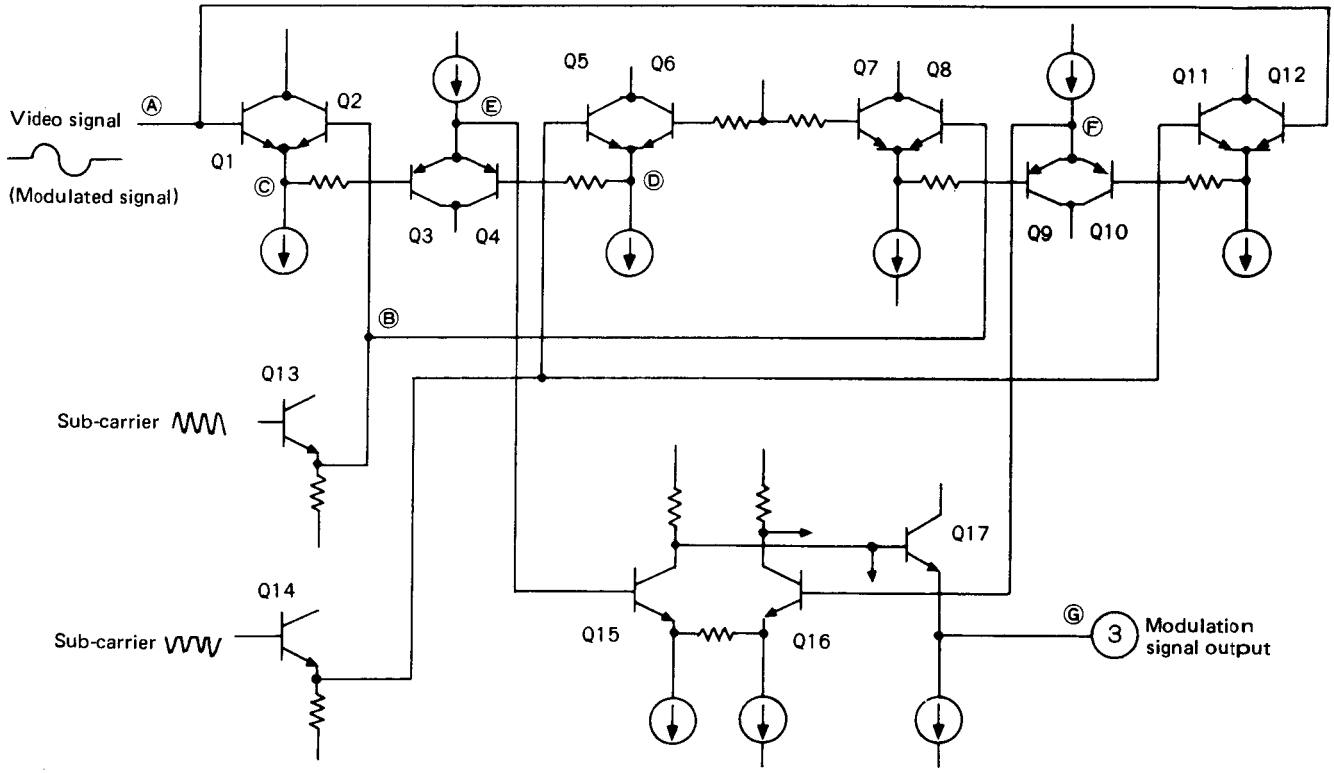


Fig. 3-28 Modulation circuit

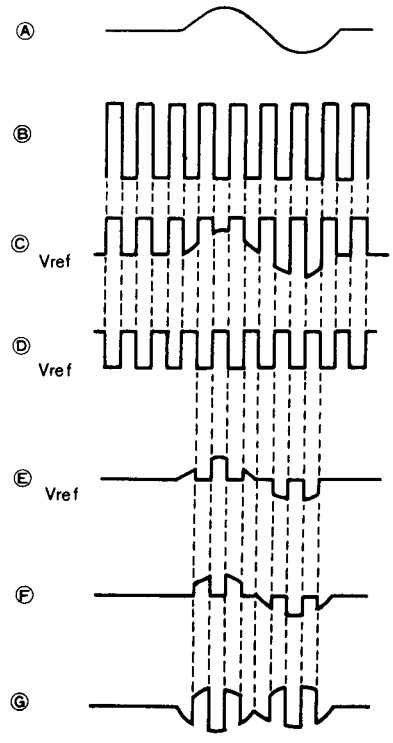


Fig. 3-29

3–3 Deflection circuit

3-3-1 Horizontal deflection circuit

Main functions of this circuit are: Horizontal deflection of the VIDICON and CRT, and generation of the electrode voltages of the VIDICON and CRT. The operation is almost the same as that of the horizontal deflection circuit of a TV set but it is small.

The horizontal deflection transistor Q207 is driven by the pulse as shown in Fig. 3-30, and the flyback pulse of approx. 150Vp-p with the pulse width of approx. 6 μs is obtained at the collector of Q207. This pulse is supplied to the horizontal deflection coil of the viewfinder via VL202 (V. LIN), VL203 (WIDTH) and in parallel with them, via the horizontal linearity coil L211 used in the viewfinder. Fig. 3-31 shows the horizontal deflection circuit. RV206 is to adjust the horizontal centering of the camera; it superimposes DC current over the horizontal deflection current and adjusts the horizontal deflection position.

This flyback pulse is rectified and used as the cathode blanking power supply of the VIDICON and the target voltage. The flyback pulse is boosted by T201 and supplies the DC 1,000V to G6 of the VIDICON and 5,000V, to the anode of the CRT.

DC −140V is rectified by D205 to supply the G1 voltage of the VIDICON and the G1 voltage of the CRT. The G1 voltage of the VIDICON is adjusted to the best beam level by RV207. Brightness of the viewfinder is controlled by adjusting the G1 voltage of the CRT using RV208. When the beam level is low, the bright section disappears or trails when it is moved. On the other hand, when it is too high, the focus becomes weak or the picture is distorted.

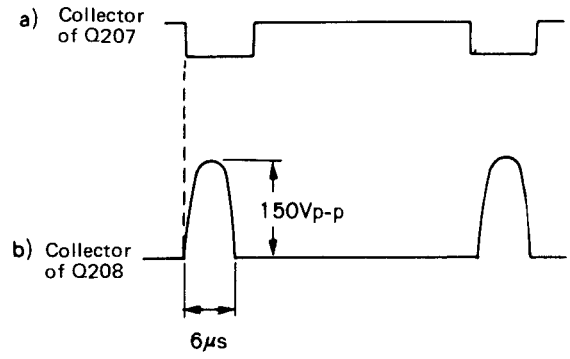


Fig. 3-30

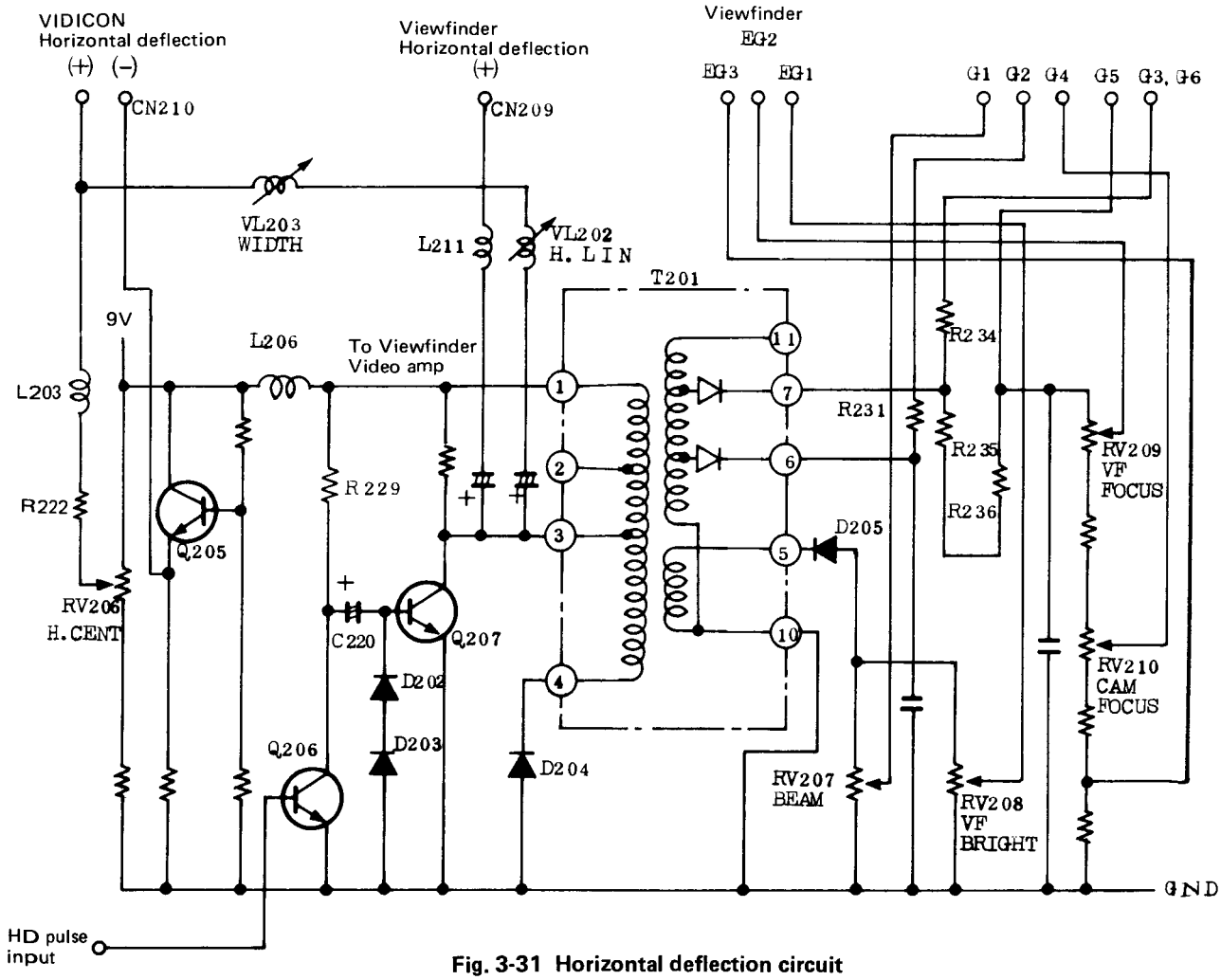


Fig. 3-31 Horizontal deflection circuit

3-3-2 Vertical deflection circuit

When a positive VD pulse is applied to Q201, a negative VD pulse is generated at Q202, and the sawtooth wave voltage is generated in the integrating circuit composed of R204, C201 and C202 by repetition of ON/OFF operation of Q202.

IC201 is the power IC which amplifies the sawtooth wave to make it a constant power output. RV202 (HEIGHT) simultaneously adjusts the vertical height of the camera and viewfinder, and RV201 (V. LIN) simultaneously adjusts the vertical linearity of the camera and viewfinder. RV204 (V. CENT) adjusts the vertical position of the camera. RV203 adjusts the vertical height of the viewfinder alone.

The output current from pin 6 of IC201 is used for vertical deflection of the camera and viewfinder. Adjust the viewfinder section in the above order after adjusting the camera section.

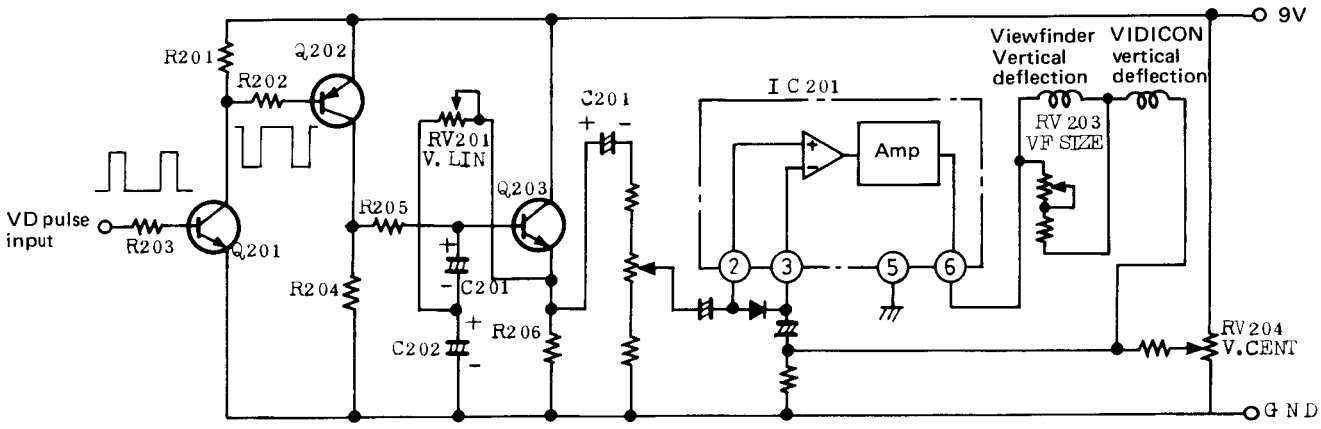


Fig. 3-32 Vertical deflection circuit

3-3-3 Viewfinder video amp. circuit

Q204 is the video amplifier transistor; it supplies the video signal to the emitter via RV205.
At the same time, the blanking pulse which is produced by shaping the horizontal/vertical deflection signals is supplied from the base. The video signal with blanking added is obtained at the collector, and this signal is supplied to the grid (EG1) of the viewfinder.

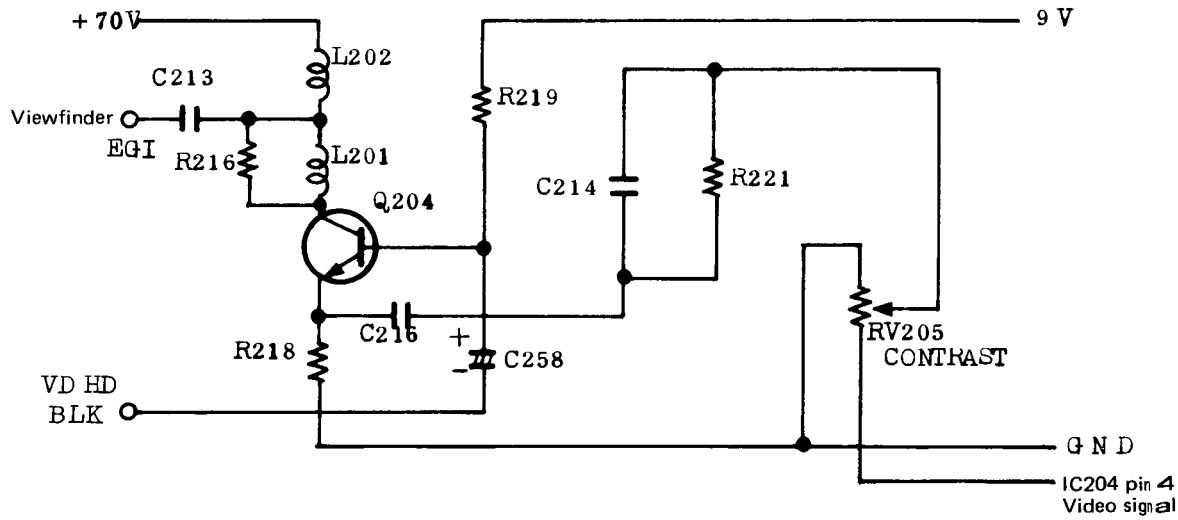


Fig. 3-33 Viewfinder video amp. circuit

3-3-4 AFC circuit

IC202 is supplied with power from the power select circuit composed of Q210, Q211 only when the picture in the viewfinder is the return picture for monitoring.
The return signal supplied from IC202 pin 10 is sync-separated by the SYNC separation circuit and supplied to the horizontal AFC circuit. The Phase detection signal is supplied to the VCO (Voltage Control Oscillator) from pin 12 and the oscillation frequency waveform of which has been synchronized with the input signal is shaped by Hore-Pre-Drive. Then, this signal is supplied to the deflection circuit via the drive select circuit.

At the same time, only the V-SYNC component is derived from the SYNC separation output pin 8 by the filter and supplied to pin 7. This signal synchronizes directly the vertical oscillation circuit (V. OSC) via the V-SYNC circuit.
The synchronized signal is output from pin 17 via the V-DRIVE section and the V. BL shaping section, and supplied to the vertical deflection circuit via the drive select circuit.

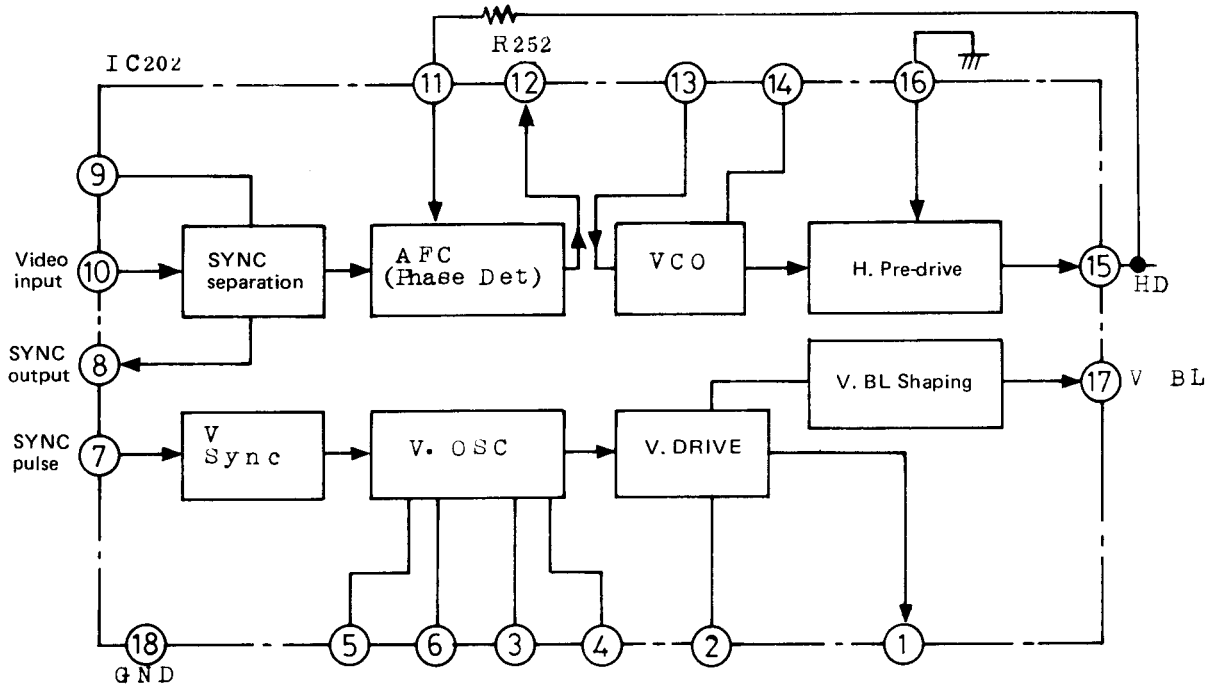


Fig. 3-34 Schematic AFC circuit

3-3-5 Video output select/Video SYNC mix and buffer circuits

The video signal which has passed through R266 is mixed with SYNC signal from R267 and supplied to IC204 pin 11. Q3 of IC204 is the output transistor, and outputs a composite video signal from pin 7 via the resistor (approx. 68Ω) between pins 7 and 8.

Q4, Q2 and Q1 compose the automatic select circuit of the return video signal. When the DC of 3V or more is supplied to pin 11 externally, Q2 is set to ON, pin 11 is set to the GND level, Q3 is cut off and the video signal from the camera supplied by pin 11 is not output from Q3.
The output signal (pin 13) from the collector of Q1 supplies H level to the drive select circuit (IC203) and the base of Q211 to switch the drive signal to the output signal of IC202 which is synchronized with the external signal.
The external video input signal from pin 7 is supplied to IC204 pin 5 via R5, pin 8, IC205 pins 10, 11, and then supplied to the viewfinder video amp. and IC202 via IC204 pin 4.
Q5 of IC204 is a buffer; it receives the video signal input from pin 5 and outputs it from pin 4. Q6 is the circuit corresponding to the 2-line automatic selection.

Analog SW IC205:

In the camera mode, the VTR/camera select switch is set to "CAMERA", IC204 pin 1 is set to Hi, IC205 pins 12, 13, Hi and pins 11 and 10, short-circuited, pins 1 and 2, short-circuited; and pins 5 and 6 are set to Lo and pins 9, 8 and pins 3, 4 are open.
The signal (Camera signal) from IC204 pin 8 is supplied to IC204 pin 5 via IC205 pins 11, 10, and supplied to the viewfinder video amp. via pin 4.
In the VTR mode, the VTR/camera select switch is set to "VTR" and IC204 pin 1 is set to Lo.
IC205 pins 13, 12 are set to Lo, pins 1, 2, pins 11, 10 are open, pins 5, 6, Hi and pins 3, 4, pins 9, 8 are short-circuited.
As a result, the return VIDEO signal of the camera and connector is supplied to IC204 pin 5, and output from pin 4, and supplied to the viewfinder video amp. and IC202.
At the same time, H level is supplied to IC204 pin 10 via IC205 pins 3, 4, and H level is supplied to IC203 and the base of Q211 from pin 13 with Q2 of IC205 set to ON and Q1, OFF, to control IC203, and the drive pulse synchronized with the VTR signal produced by IC202 is supplied to the deflection circuit.

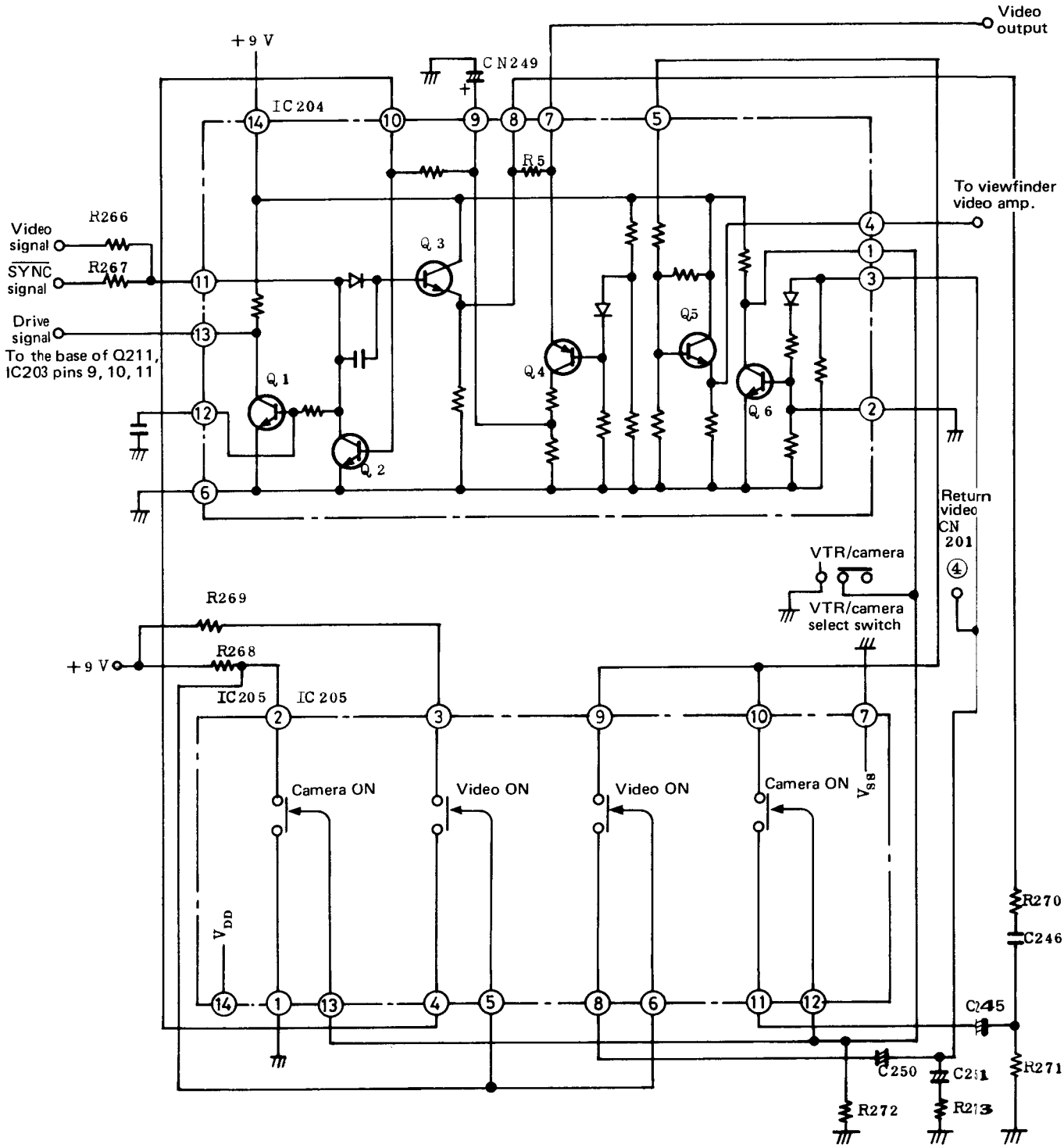


Fig. 3-35 Video output select, Video, SYNC mix and buffer circuit

HITACHI SALES CORPORATION OF AMERICA
Eastern Regional Office
1200 Wall Street West, Lyndhurst, New Jersey 07071
Tel. 201-935-8980
Mid-Western Regional Office
1400 Morse Ave., Elk Grove Village, Ill. 60007
Tel. 312-593-1550
Southern Regional Office
510 Plaza Drive College Park, Georgia 30349
Tel. 404-763-0360
Western Regional Office
401 West Artesia Boulevard, Compton, California 90220
Tel. 213-537-8383

HITACHI SALES CORPORATION OF HAWAII, INC
3219 Koapaka Street, Honolulu, Hawaii 96819, U.S.A.
Tel. 808-836-3621

HITACHI SALES CORP. OF CANADA Ltd.
3300 Trans Canada Highway Pointe Claire, Quebec, H9R1B1, Canada
Tel. 514-697-9150

HITACHI SALES EUROPA GmbH
2 Hamburg 54, Kleine Bahnstraße 8, West Germany
Tel. 850 60 71-75

HITACHI SALES (U.K.) Ltd.
Hitachi House, Station Road, Hayes, Middlesex UB3 4DR, England
Tel. 01-848-8787 (Service Centre : 01-848-3551)

HITACHI SALES SCANDINAVIA AB
Rissneleden 8, Sundbyberg, Box 7138, S-172-07 Sundbyberg 7, Sweden
Tel. 08-98 52 80

HITACHI SALES NORWAY A/S
Oerebekk 1620 Gressvik P.O. Box 46 N-1601 Fredrikstad, Norway
Tel. 032-28050

SUOMEN HITACHI OY
Box 151, SF-15100 Lahti 10, Finland
Tel. Lahti 44 241

HITACHI SALES A/S
Kuldyssen 13, DK-2630 Taastrup, Denmark
Tel. 02-999200

HITACHI SALES A.G.
5600 Lenzburg, Switzerland
Tel. 064-513621

HITACHI-FRANCE (Radio-Télévision Electro-Ménager) S.A.
9, Boulevard Ney 75018, Paris, France
Tel. 201-25-00

HITACHI SALES WARENHANDELS GMBH
A-1180/Wien, Kreuzgasse 27
Tel. (0043222) 439367/8

HITACHI SALES AUSTRALIA Pty Ltd.
153 Keys Road, Moorabbin, Victoria 3189 Australia
Tel. 95-8722

VK-C600(U,C)E TK No. 1571E TOKAI

Printed in Japan (K)